OUR COMMON

INSECTS.

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OUR COMMON INSECTS:

FIRST STEPS

TO

ENTOMOLOGY.

BY

MRS. E. W. COX.

> "That which on earth most vile doth live,
> Some special good unto the earth doth give."
>
> SHAKSPEARE

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PREFACE.

MANY interesting and instructive books have been written on Entomology; and it is rather with the hope of leading to the perusal of these than with any claim to the merit of originality that this little work has been written. The authoress has endeavoured to give, in as condensed a form as possible, a history of the common insects of this country, with their popular names, as well as their less familiar titles of foreign derivation. She has attempted no systematic classification, because to give a slight sketch of even half of the genera and species of our common insects only would enlarge her work too much, and also necessitate more study in the reader than the class of book ought to require. "Our Common Insects" is not intended for children; indeed many parts of it would be quite incomprehensible to them. It is hoped, however, that to some persons of mature age (unable, it may be, from want of time, to make a study of entomology) this popular work may be welcome by enabling them, without much trouble or any previous knowledge on their part, to obtain an insight (however superficial) into the habits of some of the most interesting beings which daily surround them.

July, 1869.

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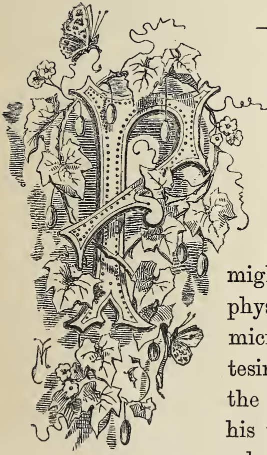
ENTOMOLOGY.

INTRODUCTION.

A GLIMPSE AT INSECT PHYSIOLOGY.



FEW branches of Science have suffered as much from neglect and derision as Entomology has done. Does the minuteness of its objects give rise to this injustice? If so, we might as well assign to the physiologist (who carries on his microscopic studies among infinitesimal molecules) a position in the scientific world inferior to his whose interest is confined to exhuming the gigantic remains of extinct animals. With no invidious comparison we cannot doubt that pre-eminence is due to the former student.

Or does the unsightly appearance of many insects prejudice us against a more familiar acquaintance with their kind? If so, let us examine them more carefully, and doubtless we shall be repaid by finding them possessed of external and internal beauties of colour and structure, not surpassed by any other part of the animal kingdom. If, however, we object to them on account of the injury they do to our property, pause we a moment to inquire whether the benefits we receive from insects do not more than counterbalance the many evils of which they are the cause. Finally, when we remember the important place in our universe assigned by the Almighty Creator to these minute beings, let us inquire whether we are justified in treating them with neglect and indifference. The conclusion, doubtless, to which every thoughtful mind will arrive is, that Entomology is by no means unworthy of elevation to a level with any of her sister sciences; and for this reason we subjoin the following sketch, rather with the hope of inducing our readers to enlarge their inquiries as to the habits and nature of insects, than with that of supplying any new information on the subject.

Among the number of living beings commonly called insects, many are not correctly arranged under this class. The spider, for instance, wanting wings and the three distinctive sections of the true insect, belongs to a separate class, that of the ARACHNIDÆ; and centipedes, although popularly called insects, must be placed among the MYRIAPODA. There are, however, apterous, or, apparently, wingless insects; but all true insects have the organs of flight, in many species so imperfectly developed as to be with difficulty discernible; but existing in all kinds in a rudimentary form, if not fully developed. This class has been divided by eminent naturalists into eight distinct orders, according to the nature of the wings, the Greek word *pterois* (winged) forming, with its compound substantive, the name whereby each order is distinguished, and composing the class *insecta;* the members whereof, as their name signifies, are insected, or divided into parts—the head, with the eyes, jaws (mandibles), and feelers (antennæ); the thorax (chest), from which spring the wings and legs; and the abdomen, which in some species contains a sting or organ of offence, as well as an ovipositor, whereby the eggs are deposited in situations favourable to the development and nutrition of the young. Insects have neither distinct flesh nor bone, but something resembling both, the body being equally hard in its external and internal structure.

Most insects undergo metamorphoses, or transformations, into three distinct stages: first, the larva, or grub, when they are most voracious, and often commit great ravages in the vegetable world; secondly, the pupa, or torpid state, wherein they are inert, and do not feed; and, thirdly, the imago, or perfect insect, during which final period they propagate the species, eat very little, and seem to have the full enjoyment of their airy existence. It is a curious fact concerning these apparently insignificant beings, that they exceed in number all other classes of animals put together, containing, it is said by eminent entomologists, at least 400,000 distinct species, whilst, including all other classes of animals, 30,000 is the highest number as yet estimated. May we not reasonably calculate, moreover, that the number of species still to be discovered at home and abroad, are likely to be as many again as those already known ?

The eight generally recognised orders of insects are :

1. Coleoptera (Beetles).
2. Orthoptera (Grasshoppers, Earwigs, &c.).
3. Hemiptera (Plant Bugs and Lice).
4. Diptera (Gnats, Flies, &c.).
5. Neuroptera (Dragon Flies, May Flies).
6. Hymenoptera (Bees, Wasps, &c.).
7. Lepidoptera (Butterflies and Moths).
8. Aptera (Lice).

The anatomy of the insect varies according to the order to which it belongs. Although its hard skin-like covering has a texture so much like horn, that it has been mistaken for that substance, Dr. Carpenter informs us that it is of a very different material, a substance called *chitine,* of definite organic structure, the particles whereof, when closely united, produce the elasticity of texture so essential to the activity and happiness of these airy beings. We have in insects a perfect type of one of the most wonderful arrangements of the animal frame, namely, its muscular structure, which is seen, under a high magnifying power, to consist of transverse layers, arranged about one nine-thousandth part of an inch apart; when contraction takes place, these, of course, are more crowded, whilst during relaxation they retire from each other, thus forming a natural spring, whereby some insects, such as the common Flea (*Pulex irritans*), the *Elater* beetle, larva of the Wire Worm, and others whose powers either of running or flying are limited, are possessed of great muscular strength, which enables them to take enormous leaps, in order probably to avoid enemies which might otherwise prey too extensively upon them. The muscular power of some insects is almost incredible. In proportion to its size, the common Cockchafer (*Melolontha vulgaris*) is six times as strong as a horse.

The most remarkable organ perhaps possessed by insects is the eye, which in nearly all kinds is of a compound structure, consisting of from 12,000 to 30,000 separate lenses, each forming a perfect eye. All these distinct cornea, however, are united so as to form one common disc, resembling under the microscope the meshes of a net. The little water beetle, commonly called Whirl Wig (*Gyrinus natator*), is furnished with two sets of eyes, one above for seeing in the air, and a second beneath for distinguishing objects under water. Some insects, however, have simple eyes (ocelli), which are placed in groups of two or three on the upper part of the head; of the nature of these, however, as yet but little is positively known. The structure of the wings differs in each distinct order of insects. In the Lepidoptera (butterflies and moths) they are covered with many thousands of coloured scales, arranged like tiles on a roof; to these scales these insects owe their various hues, the wing membrane, wherein the scales are placed, being quite colourless. In ants, bees, wasps, and other Hymenopterous (membraned-winged) insects, the wings consist of a colourless and senseless membrane, which may be cut or torn without giving pain to their possessor; whilst in the dragon flies and other Neuropterous insects these organs are permeated with an elaborate net-work of nerves, probably rendering the organs of flight highly sensitive. In the beetles (Coleoptera) the pair of wing-cases are hard and opaque, forming sheaths (elytra), which, when in a state of rest, constitute a protecting cover to the true wings. These cases seem to take no part in the insect's flight, but remain motionless while the beetle is in the air.

The sounds emitted by insects are not produced, as in the higher animals, by the motions of air in the larynx, but mostly, it is supposed, either by rapid vibration of the wings, or friction together of different parts of the body. The song of the grasshopper is probably caused by the alternate expansion and contraction of a drum-like membrane; and in some species of the same order (Orthoptera) the sound is supposed to arise from friction of the thighs against nervures, somewhat like the cords of a musical instrument. We have, however, caught insects, and, for the purpose of more accurately investigating this interesting part of their nature, have held the wings and legs in order to prevent any perceptible motion of these members; the sounds, however, were not prevented, but a sharp vibration was perceptible—produced, we believe, by the motion of air on the valves of the respiratory spiracles, which we shall hereafter have occasion more particularly to notice.

The most remarkable adaptation of form to function is in few cases more beautifully manifested than in the formation of insects' legs; those of the common House Fly (*Musca domestica*) being perhaps the most curious example of special provision on the part of the Almighty Creator for the welfare and protection of those animals which we are apt to consider as among the lowest of His works. The legs of the fly, whose nature is to walk on smooth surfaces, are provided with suckers connected with the foot by a funnel-shaped tube, convex above and hollow beneath, the concave part being covered with down. A partial vacuum is produced by the contraction and expansion of these membranous suckers, so that by pressure of the external air this insect is enabled to stand against gravity, with its back downwards on smooth places, where very few enemies are enabled to follow it. The feet of heavy beetles, whose weight would cause them constantly to fall from the high places they frequent, are supplied with hooks, whereby these insects are enabled to cling to the surface of the substances upon which they feed, such as the under part of leaves, where some species, especially the cockchafers (Melolonthidæ), enjoy their sloth-like existence during the heat of day, with little chance of disturbance from their shady retreat. This is also the case with some kinds of caterpillars. The legs also of water insects are admirably adapted to their mode of life. In *Dyticus marginalis,* a large beetle inhabiting the edges of ponds, the fore-legs are supplied with suckers, which enable it to retain a firm hold of its prey, which chiefly consists of fish and water larvæ much stronger than itself. So firm, indeed, is the grasp it is thus enabled to take of its prey, that we have frequently caught these beetles by means of a bit of raw meat tied to a string, to which they will cling so tightly that they may be drawn from the water without relaxing their hold of the bait. The hind-legs are feathered with hairs and shaped like oars, to facilitate the insect's boat-like progress through the water.

The mouth is always adapted to the insect's mode of feeding; thus, we find the gnawing beetles provided with strong jaws (mandibles) which are calculated to divide very solid substances; whilst bees, and other insects which feed upon the juices of plants, are possessed of a long spiral tongue, which they thrust into the nectaries of flowers, and through it extract their sweet contents. Parasitic insects, which live upon other animals, have the mouth formed for suction; whilst gnats and some flies have a lancet-like apparatus admirably adapted to their sanguinary mode of living. This apparatus contains, as well as three or four lancets, a poisonous fluid which promotes the flow of blood to the wound inflicted.

The insect's stomach is little more than a dilatation of the alimentary canal; but in the carnivorous species the intestine is as complicated as that of the mammal commencing with an œsophagus, or tube, whereby the food is conveyed to the crop or insalivatory pouch, and thence to the gizzard, the function whereof, as in birds, is to grind up the more resisting portion of the food, which now passes into the true stomach, and thence into the intestine, where its digestion and assimilation, as in the higher animals, is promoted by glandular and biliary secretions. The heart is represented by a longitudinal tube which propels the circulating fluid to all parts of the body. This tube, however, not being connected with regular lungs, is much less complicated in its structure than the analogous organ in higher animals. We have said the insect has no true lungs; respiration, however, is carried on by means of spiracles (tracheæ), which ramify from the exterior surface of the body into the various organs and tissues, to which they immediately conduct the needful supply of oxygen. As the entrance to these spiracles might easily be clogged, and the insect's respiration thus impeded, they are protected in some species by valves, and in others by tufts of hair, forming a kind of grating over the orifice; whilst in water insects we find a curious ciliary covering, adapted to regulate the quantity of air respired both in and out of the water. The Cheese-hopper (*Piophila casei*), whose tracheæ are situated near the head (instead of, as in most insects, along the sides), has the power of spreading at will a membranous covering over the breathing orifices, lest, whilst boring for food, the particles of cheese should enter the tracheæ and cause suffocation.

Swammerdam justly observes, that in these *despised little creatures* is displayed, in a special manner, the providence of God over the lowest of His works. It is written of the despised little sparrow, "One shall not fall to the ground without your Father;" and indeed, in the insect world, there is no being so apparently insignificant as not to be the object of its Creator's care and providence. Can we, then, be justified, in passing with indifference and neglect a class of beings deemed worthy of such an important and extensive place as they really occupy in the vast Creation?

THE EGGS OF INSECTS.

NO PART of the history of insects is more interesting than the manner whereby, in depositing her eggs, the parent provides for their safety, as well as for the prosperity of her future young. Among the COLEOPTERA (beetles), we find some species (*pilularii*) rolling up their eggs in pill-like balls, composed of the dung wherein they are deposited, thus protecting them from inclemency of weather and the attacks of enemies. The eggs of the cockroaches are inclosed in a bean-shaped capsule, which the mother cements to substances calculated to afford food and protection to the larvæ. The Horse Breeze Fly, or Bot,* among Dipterous insects, oviposits on the hair of cattle, when the animal, probably annoyed by a glutinous matter whereby the eggs are cemented to his coat, licks them off and swallows them. After being hatched in the horse's stomach the young larvæ are naturally voided, and bury themselves in the earth until the period of their final change. Some of the Diptera (gnats whose larvæ are entirely aquatic) take their station at the extremity of some floating substance, and, forming their eggs into a boat-shaped mass, leave them to float on the surface of the water for a period of two or three days, when the larvæ commence their aquatic existence. The Lepidopterous insects (moths and butterflies) will roam for miles over field and flower, in search of the plants whereupon it is the nature of their young to feed whilst in the caterpillar state. The Ichneumon Fly leaves her eggs in the bodies of other insects upon the living bodies whereof the larvæ prey, to the great injury of their host. We have, however, seen the caterpillar of a large cabbage butterfly eat a good meal of its favourite vegetable when the larva was more than half devoured by ichneumons, but five out of six of our larvæ lived a very short time after being attacked by their parasite. The Crane Fly (daddy longlegs) is provided with a long, strong ovipositor, whereby she is enabled, whilst in a perpendicular position, to pierce the earth to a considerable depth, where the larvæ can reach the roots of grass and other herbs forming their favourite food.

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* Of Bracy Clark, F.L.S.

A curious fact, mentioned by Kirby and Spence, is that those insects whose eggs remain through the winter are careful not to gum them to leaves which might be blown away with the insect progeny, far from their destined food. These sagacious little beings, unlike the summer-hatching insects, fasten their eggs to the trunks or branches of trees, where, in the early spring, the young may feast amply on the newly-expanding leaves which surround them. Nature, too, further protects these winter eggs, by providing them with a thicker shell than that of those which are destined for summer incubation ; they are also packed in groups, the interstices whereof are, in some cases, filled up with a tenacious gum, which effectually protects these eggs against accidents. This, however, is not the case with all insects, some species leaving their eggs in exposed and unprotected places, whereby, doubtless, many eggs are destroyed. The ill-effects, however, produced upon insects' eggs by inclemency of weather are rather the mechanical mischief caused by rain, hail, and wind than any injury produced by cold, for, by a wise and beautiful provision, eggs cannot be frozen. No degree of cold (even 22° below zero) has any power to destroy their vitality, as they have been frequently hatched after exposure to this low temperature. With the exception of bees and ants the mother is rarely, if ever, seen in the vicinity of her future nursery—an instance of apparent neglect to be accounted for by the fact, that among most species she perishes almost immediately after depositing her eggs on the substance calculated to supply her young with proper food, a wise arrangement to check the excessive multiplication of insect life, which would otherwise inevitably overwhelm us with its numbers, one mother being capable of producing young to the amount of millions of millions in the course of a summer.

The eggs of insects are generally globose in form, although sometimes oval. Those of the Common Louse (*Pediculus humanus*) are curiously constructed with a lid, attached by hinges, whereby the young, which are not very strong, make an easy exit. In describing the Hymenopterous order of insects, we shall notice with what assiduity the Yellow Ant (*Formica flava*) nurses and protects the eggs of the Oak Aphis (*Aphis quercus*), in order to feast upon the sweet fluid which exudes from this little insect's body.

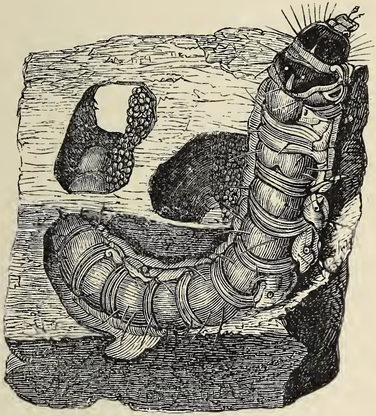
THE LARVÆ OF INSECTS.

IN DESCRIBING the different orders of insects, we shall be of necessity restricted as to the details of each separate state assumed by these beings in the course of their transformations. Of the perfect insect and its manner of depositing its eggs, we have already given some account; and it remains for us now also to notice it in its first stage of actual existence (the *larva* or grub), wherein perhaps it possesses more interesting features than at any other period of its life.

To commence with our first order, the COLEOPTERA. Most of the beetles are more destructive during their larva state than when fully developed. For the most part, these grubs bury themselves to a great depth for a very long period, the cockchafer and others of the SCARABÆII family remaining for several years under ground before their final change. During this period they are very destructive to the roots of trees and shrubs, which they eat voraciously. We are all familiar with the little nut maggot, which becomes a pretty beetle, the Nut Weevil (*Balaninus nucum*); but some persons may not be aware that the destructive Wire Worm, when fully developed, is also a beetle (*Elater striatus*). At night it will be seen to leave a beautiful phosphorescent track wherever it crawls. The Burying Beetle (*Necrophorus*) provides for its larvæ by undermining the dead bodies of mice, birds, moles, &c., thus making a cemetery for putrifying matter, which, except for the help of this insect sexton, and the still more useful blow fly, would be very annoying and offensive to mankind. The larvæ of the ORTHOPTERA (cockroaches, earwigs, grasshoppers, &c.) bear a greater resemblance to the perfect insect than we find to exist in any other order of their class, the only difference between their larva and imago states being that the larvæ are of a lighter colour, and their external covering is of a softer texture than that of their parents. Some of these insects form an exception to the almost universal law of nature, whereby the mother insect perishes immediately after depositing her eggs; thus we find the careful earwig tending and covering her larvæ much in the same way as a hen shelters and follows her young brood. The larvæ of the HEMIPTERA differ from their parents in being without wings. The insects of this order, however, remain in the larva state for a shorter period than that occupied by most others in the first stage of existence. We have kept under a glass the newly-hatched larvæ of the Poplar Aphis, and found them winged and fully developed in the course of twenty-four hours. Bees, wasps, and ants (HYMENOPTERA) entrust their larvæ to the neuters, these insect nurses never failing in their duties of feeding and watching the infant insects placed under their care. Most of the DIPTERA, especially gnats, are very interesting in the larva state. We shall, when describing the gnat hereafter, describe the curious manner in which it passes from the larva to the perfect state. In the same order, some flies have rendered us too familiar with their disgusting larvæ. To the Blow Fly (*Musca vomitoria*), however, we are indebted for the important service rendered to us by its maggots in clearing away putrifying substances, which are devoured by these creatures in an incredibly short space of time. Another species of the same family (*Muscidæ*), the Chequered Blow Fly (*Sarcophaga carnaria*), gives birth to its larvæ in a curious long coil, resembling a watch-spring. Réaumur, who unrolled one of these strange masses of living beings, found it about 2in. in length, containing, he tells us, as many as 20,000 embryo flies.

The larvæ of the NEUROPTERA are for the most part aquatic. We have already given some account of the insatiable voracity of the embryo Dragon Fly. Fortunately for all other occupants of the same pond, these insect cormorants are very slow in their movements—their progress through the water being effected by a succession of jerks caused by jets of water propelled from the posterior extremity of the insect's body. The

Caddis Fly, familiar to the angler, constructs, while in the larva state, a curious cylindrical case of small pebbles, fragments of reeds, the shells of young water-snails, and a variety of other substances, selected according to the habits of the insect architect, each separate species seeming to have its own peculiar way of constructing its habitation. These cases are, however, always open at each extremity, enabling the larva to protrude its head and thorax with the anterior legs, so as to carry its house wherever it may choose to roam. The May Fly (*Ephemera vulgata*) is also aquatic during the larva state, wherein it continues, for a period of two or three years, a protracted existence, which would seem to compensate for its short life while on the wing. It excavates small holes in the banks of rivers and ponds, whence it comes forth, when in the perfect state, for a few hours' life in sunny weather, for the purpose of perpetuating its kind. Until we trace its progress through the larva state, the gay Butterfly (amongst the LEPIDOPTERA) possesses, perhaps, fewer interesting features than any other insect—its life in the perfect state being simply one of *beautiful idleness.* Its only interesting habit is that of depositing its eggs on substances affording proper food for its young, a degree of sagacity which it possesses in common with every other member of the insect world. In the caterpillar (larva state), however, according to the species, we find among the insects of this order many distinct peculiarities, especially as to their method of preparing their own tombs, wherein they have to remain often for many months in a death-like state of torpor. At this period we find some carefully inclosed in a silken cocoon, in sheltered situations, whilst others bury themselves, or provide for their safety in the pupa state by rolling themselves in various kinds of leaves. The *Sphingidæ* (Hawk Moths) have a spine projecting from the posterior extremity; and the caterpillars of another extensive family of moths (*Geometridæ,* Loopers) may be recognised by their peculiar mode of *looping* their bodies as a means of progression. The larva of the Goat Moth (*Cossus ligniperda*) is one of the largest and strongest of British insects. It is very common in many parts of Middlesex, and is possessed of such immense muscular strength that it has power to move with ease a pressure of half a pound, or ten times



LARVA OF GOAT MOTH.

its own weight; its muscles, when seen under a microscope, resemble a beautiful pattern of fine Brussels lace which, Kirby and Spence remark, would be sufficient to tempt "any lady fond of such exhibitions." Every schoolboy is acquainted with the silkworm's interesting life while in the larva state. The grub of the little Clothes Moth (*Tinea vestianella*) covers itself while in the larva state at the expense of our furs and woollen goods, whereof it makes, by felting the particles together, a beautiful and comfortable overcoat in the form of a cylindrical case open at both ends. Lepidopterous larvæ are almost universally vegetable feeders—those of the Tabby Moth (*Aglossa pinguinalis*) forming a single exception to the herbivorous nature of this order of insects. This insect will feed voraciously on fat, butter, and grease of any kind. The caterpillars of some butterflies will devour their own cast-off skins.

CHRYSALIDES.

THE least interesting part of the insect's life is perhaps that period when, rolled up mummy-like in an outer case, it remains stationary, and apparently lifeless, often for months or years, without taking food or showing any other signs of vitality. Some kinds, however, especially among the ORTHOPTERA (grasshoppers, cockroaches, &c.), do move sluggishly when pupæ. They will also feed sparingly upon the substances so greedily devoured by them in the preceding (larva) state.

Insects differ considerably according to their orders, both as to their external appearance and inward structure during the pupa state. Thus we find the beetles (COLEOPTERA) and also some families of DIPTEROUS and HYMENOPTEROUS insects possessed of two distinct sheaths—the outer one containing the wings, legs, and antennæ which are consequently separated from the body, and a second, which incloses the chest and a portion of the abdomen. This kind of pupa was called by the ancient naturalists *"the incomplete pupa,"* a distinction not generally observed by modern entomologists.

Among the LEPIDOPTERA we observe a somewhat different arrangement, these insects being inclosed when chrysalides in one common case, and consequently having the external members folded closely over the body. The word chrysalis was used by the Greeks to signify *gilded*, a term formerly applicable only to the Lepidopterous order. More recently, however, it has been indiscriminately applied to insects which are without the golden hue peculiar to some butterflies and moths during the second state. Truly interesting is the insect's manner, while in the larva state, of preparing a tomb to contain its helpless body during its pupa condition. Some of the Lepidoptera remain for many months in the larva state, whilst others emerge in a few days.

The larvæ of moths either bury themselves or spin a cocoon (case) to serve as a covering to the pupa, and butterflies are generally found suspended by a silken skein of about fifty threads; this skein crosses the insect's body, being securely fastened to some leaf or twig, in a sheltered situation, where the helpless pupa may remain in safety until the final change. Most persons have observed the curious way in which rose-leaves are often glued and folded together at the season when the young flower-buds are beginning to appear. This effect is produced by the little Rose Moth (*Lozotonia rosana*), which thus prepares a snug dormitory on our favourite flower, never quitting this verdant couch until the period of the moth's appearance.

The Lilac-Tree Moth sets to work in a very ingenious way to construct for itself a place of shelter during the pupa state. This moth, which lays only a single egg on each separate leaf, begins by fastening several cords to the upper extremity of the leaf, securing the other end of the thread to a lower part, where it tightens its cordage, so as to bring each extremity of the leaf together, thus forming a kind of winding-sheet to serve as a protection during the state of torpor now to be undergone. The caterpillar, as it approaches its change, continues to draw this cylinder gradually closer, taking care, however, to leave it open at each end for the exit of the future moth. Many other species of the leaf-rolling caterpillars pursue much the same process as that now described.

Some of the large moths form for themselves during the pupa state a snug bower, composed of leaves, which the larva separates from the trees whereupon it has been accustomed to feed. The caterpillar of the Goat

Moth (*Cossus ligniperda*) secretes itself in the trunk of the willow, boring large holes in that tree, which materially weaken it, causing it often to be blown down when exposed to winds which other trees resist without injury. Westwood gives an interesting description (somewhat too lengthy and minute for present quotation of the Peacock Butterfly's curious manœuvres on assuming the pupa state. This author, however, concludes thus: "We now see the chrysalis suspended, head downwards, by the side of the old caterpillar skin, which it ultimately gets rid of by a succession of gyrations, which burst the silken threads holding the caterpillar skin, which, no longer supported, falls to the ground."

The Puss Moth (*Cerura vinula*), which, although somewhat rarer than many of the insects we have named, is by no means an uncommon insect. We have found one of its larva in Lincoln's-inn Gardens; and within ten or twelve miles of London, where the poplar is abundant, these curious caterpillars are frequently met with. We have reared them under a bell-glass, and found great interest in watching their changes. The most curious part of their history is the way in which they construct their winter quarters—not a cocoon, like other moths, but a kind of sarcophagus, called an aurelia, formed from the bark of trees gnawn by this larva, when full-grown, into a fine powder, which is spread in several layers over a cage-like covering of strong web spun by the grub over its body, first in longitudinal lines, which are crossed transversely by the same material. When the aurelia is finished, it has the appearance of a large oval excrescence on the surface of the tree-bark whereof this tomb is formed. The aurelia is so hard that it can be cut with difficulty by a sharp knife—hardly any amount of manual force being sufficient to crack it. It is dissolved, however, by a liquid which the insect exudes when the time of emergence arrives.

The little Skipper Butterflies, belonging to the family Hesperidæ, hereafter to be noticed, which some entomologists consider as a link between the butterflies and moths, unlike most butterflies, create a cocoon for their pupa state.

ORDER I.

COLEOPTERA (*Case-Winged*).

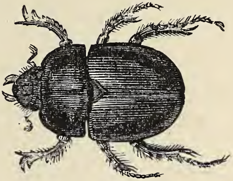
TO the order Coleoptera belong the beetles, which form the most numerous portion of the class *Insecta*. Latreille has divided this order into the four following sections, according to the number of joints in the tarsi or lower division of the leg: 1. Pentamera (5-parted); 2. Heteramera (different-parted); 3. Tetramera (4-parted); 4. Trimera (3-parted).

Our most familiar beetles belong to the eight following families: 1. Scarabæii (Dung Beetles); 2. Melolonthidæ (Cockchafers); 3. Lucanidæ (Stag Beetles); 4. Elateridæ (Wire Worms); 5. Lampyridæ (Glow-Worms); 6. Brachelytræ (Devil's Coach-Horses); 7. Coccinellidæ (Lady-Birds); 8. Carabidæ (Ground and Stone Beetles).

These families, like those of other animals, are divided by naturalists into many genera and species, which it is beyond our present object to enumerate. In the insects here represented, we have given both the generic and specific titles, the first name being generic and the second specific.

The popular nomenclature of insects differs in almost every county, in each, however, being expressive either of the little being's habits, or of some peculiar feature in its external form.

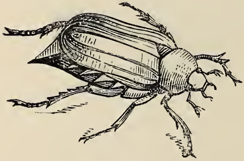
The DOR or SHARD-BONE BEETLE (*Geotropes stercorarius*) may be taken as the type of the family SCARABÆII. Vast numbers of this species may be seen flying about on summer evenings in almost all parts of the country, their blind flight against our faces rendering them far from agreeable companions in our evening rambles. The appearance of these beetles, however, is far from unpleasing, their strong steel-coloured elytra reminding us of a suit of armour, which, doubtless, they really prove to be against the attacks of many enemies.



SHARD-BONE BEETLE
(*Geotropes stercorarius*). Natural size.

The Dor Beetle is very similar to, and, indeed, only a variety of, the same species as the sacred beetle of the Egyptians (*Ateuchus scarabæus Egyptiorum*). These beetles feed chiefly upon the excrement of animals, and inclose their eggs in balls of the same, whence they are called *Pilularii*. Upon once capturing one of them, the writer was much annoyed by a small parasite which swarmed upon the beetle, and soon covered all exposed parts of her skin, causing great disgust and irritation. This parasite is probably a kind of louse (*Acharus*), whereby many beetles and other insects are infested.

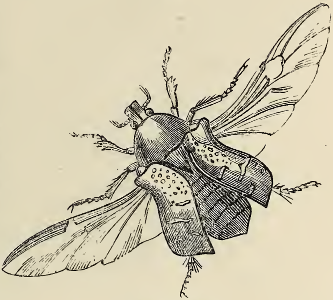
A very common member of the MELOLONTHIDÆ is the common COCKCHAFER (*Melolontha vulgaris*), also known by the popular name MAY BUG. It continues as long as three years in the larva state, during which period it commits most distressing ravages in the vegetable world, destroying the roots of our most valuable and ornamental trees and shrubs. When about to change into the pupa state, about the third autumn of its existence, the larva buries itself about a yard deep in the earth; and, if prevented doing so by confinement, invariably shows great uneasiness, and often dies. The perfect insect emerges from the pupa state in January or February, when the wing-cases are very soft, and do not acquire their natural hardness or colour for many days. It does not venture abroad before May, the fourth year after its hatching. There is another smaller species (*Melolontha solstitialis*), which appears later in the summer, and is little less destructive than its larger relation. The cockchafer is uncommon in the North of England, and hardly ever met with in Scotland. In the perfect state it is very destructive,



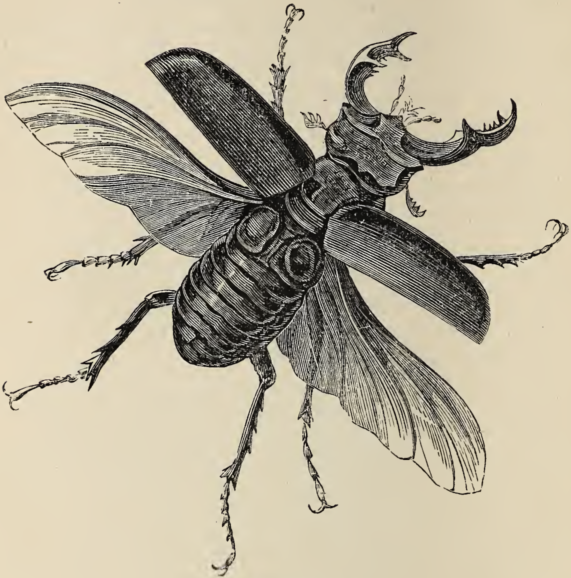
COCKCHAFER
(*Melolontha vulgaris*). Natural size.

devouring the leaves of our forest trees, especially the chesnut and sycamore; the larva, however, lives entirely upon roots, and is always a vegetable feeder.

To the SCARABÆII belongs the GREEN ROSE CHAFER (*Cetonea aurata*), which, from the copper hue of the under part of its body, is also known by the name of COPPER BEETLE. Although more abundant among roses than elsewhere, this species is also found on privet and among most garden flowers during the summer months. Like the cockchafer, the rose beetle is long in the larva state, during which period it is also very destructive to vegetation. It flies well, with a humming noise, during the hottest part of summer days, and may generally be found in swarms in the neighbourhood of privet. The elytra are ornamented near the tips with transverse white marks. We learn from Latreille that the perfect rose beetle does little or no injury to flowers, contenting itself with the honey they contain.


ROSE CHAFER
(*Cetonea aurata*). Natural size.

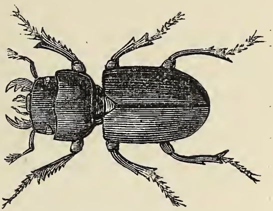
We represent the LUCANIDÆ by the great STAG BEETLE of this country (*Lucanus cervus*), which, although the largest of our beetles, and of most formidable appearance on account of its huge mandibles (jaws), is, in reality, one of the least offensive of the Coleoptera. They are abundant in the neighbourhood of the oak, upon the wood whereof they feed during the larva state. The males, which are often above 2in. in length, with chesnut-coloured elytra, may be seen on the wing on summer evenings; the female, however, is not often found flying, and is considerably smaller than her mate. The perfect insects abound upon the trunks of the lime, elm, and willow. The



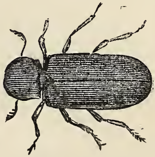
LARGE STAG BEETLE
(*Lucanus cervus*). Natural size.

grubs are found in the rotten wood of trees; they are large and fleshy, and, at the end of three or four years, form over their bodies a case of particles of wood glued together by a viscous fluid. Great numbers of these huge creatures may be found in Greenwich Park; they are also very common near Twickenham, and other parts of the neighbourhood of London.

The small STAG BEETLE (*Lucanus dorcas*), although common in Devonshire and many other parts of England, is not often found in company with the great Stag Beetle. The small stag is far less striking than its larger relation with regard to the development of the mandibles, and also frequents decayed trees in various parts of England, especially the southern and western counties.

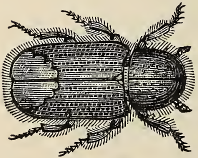

SMALL STAG BEETLE
(*Lucanus dorcas*).

Our attention is next claimed by the *Xylophagæ* (or wood-borers), among which the DEATH WATCH (*Anobium striatum*) is a very common inmate of our houses. Among those who are unacquainted with the habits of insects there is a common superstition that the strange ticking sound often heard in old houses is a sign of approaching death. This noise, however, is caused by a small beetle, which, during its


DEATH WATCH
(*Anobium striatum*).
Magnified.

boring operations, rubs the neck and thorax together, by which means this (to some persons) terrible omen is produced—a fact which, if more generally known, would save a world of causeless anxiety and uneasiness. In the larva state these insects do great injury to our furniture and the woodwork of old houses, which they gnaw continually. When captured, this little beetle feigns death with the strangest pertinacity, preferring, it is said, to suffer death under a slow fire rather than to betray the least sign of vitality. The Death Watch, on account of its retired habits, minute size, and dark colour, is very seldom seen ; and as there are often several individuals working at the same time in their boring operations, the sound proceeds simultaneously from opposite directions, thus adding to the superstitious terror wherewith, by some persons, it is regarded. The greatest evil, however, to be dreaded from it is the injury it does through its excavations in the woodwork of our houses. It is not larger than a good-sized flea.

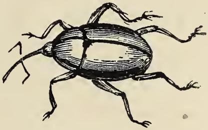
Among the *borers* is the WOOD WORM (*Tomicus typographus*), less noisy indeed, but little less mischievous, than the Death Watch. The small regular round holes which we see in what is called "worm-eaten wood," are caused by this minute beetle, which is also very destructive, both in the larva and perfect states. It does great mischief to forest trees,



WOOD WORM
(*Tomicus typographus*).
Magnified.

the soft wood of which it devours. In Germany this species destroyed as many as a *million and a half of pines;* whence the whole number of beetles working at the same time in the Hartz Forest must have been *one hundred and twenty thousand millions!* In the perfect state, the *Tomicus typographus* (so named from the figure of its burrows) is about the size of a small lady-bird, but of a somewhat longer and more slender shape.

Nearly allied to the *Xylophagæ,* or wood-borers, are the WEEVILS. They are, however, easily distinguished by a strong muzzle, which seems to be a prolongation of the anterior part of the head, and serves the purpose of drilling nuts and hard grain, wherein different species of these beetles deposit their eggs. We are all familiar with the Nut Maggot so often found in filberts and the hazel. This grub is the larva of the NUT WEEVIL (*Balaninus nucum*). The egg is deposited in the nut before it is ripe, when the puncture is healed over, the grub feeding during its imprisonment upon the nut's kernel. When full grown, it bores through the shell and escapes, burying itself during the winter. In the following spring it assumes the pupa state, and soon after attains its perfect form—a small brown beetle, with white spots on the elytra, and a curious long tusk from which the antennæ grow in a transverse position, in this respect differing from any other family of Coleopterous insects.



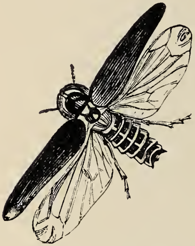
NUT WEEVIL
(*Balaninus nucum*).

It appears that the mother weevil always rejects nuts wherein any of her neighbours may have previously deposited an egg, so that more than one grub is never found in the same nut. The egg is hatched in about a fortnight, and it is remarkable that in the early period of its life the grub does no injury to the kernel. but permits it to ripen before attacking it; otherwise, the little prisoner would be ultimately starved, as it has no power of perforating another nut when the first is consumed. It is said also that the original hole bored by the mother is increased for the exit of the larva, which gnaws around the edge to facilitate an escape when the nut falls to the ground in the latter part of the summer. The perfect insect appears from the 1st to the 20th of August, but still keeps under ground for the first week after its change. These facts were ascertained by Rösel, who carefully watched the transformations of this little beetle in glasses containing earth, covered with green turf. A somewhat less familiar species of weevil, although far more abundant than that which we have just noticed, is the Corn Weevil (*Calandra granaria*), which although very minute (not exceeding one-sixth of an inch in length), is extremely destructive to our corn crops. Kirby and Spence tell us that a single pair may produce in one season 6000 descendants, and that they have been collected in bushels. This beetle is of a dark red colour, marked with several rows of deeply-impressed dots. The mother deposits her eggs at one extremity of the grain, and works inwards, so that it is difficult to ascertain whether or not the grain be sound. Unlike the nut weevil, the Corn Weevil will lay her egg in a grain which has been previously pierced. When all the farinaceous portion of the grain has been devoured, and the husk alone remains, the larva assumes the pupa state, the beetle appearing at the end of eight days, after piercing a hole through one end or the middle of the grain. During the winter it continues buried in the earth, and appears again in the early spring, when it proves the greatest enemy to be dreaded in our granaries. Fortunately the life of the perfect insect does not extend beyond one year, and those which are of full age are incapable of reproduction.

Of the *Elateridæ* (so named from the power they possess of taking enormous leaps when laid upon their backs) the most familiar species is the beetle whose larva is the too familiar Wire Worm. The beetle is commonly known by the popular names of Skip Jack and Click Beetle (*Elater striatus*). In the larva state this beetle is long, slender, and hard ; but in no other respect resembling wire, being white and ringed or jointed. They are among the greatest enemies of the kitchen and fruit gardens, and often find their way into our hot-beds and greenhouses, where these larvæ do much mischief, especially to melons and cucumbers. This species emits a phosphorescent light, which is as bright as that of the glow-worm. The extraordinary power of leaping upon its back is doubtless given to this insect

LARVA OF CLICK BEETLE (*Elater striatus*).

to compensate for the uncommon shortness of its legs—a deficiency which otherwise would deprive it of the power of recovering its natural position when once on its back.


MALE GLOW-WORM
(*Lampyris noctiluca*).

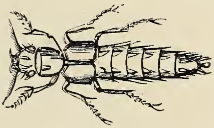
Some of our readers may be surprised to find the Glow-worm (*Lampyris noctiluca*) classed with beetles; the male, however, being possessed of wing-cases, is correctly placed by naturalists among those *Coleoptera* which constitute the family *Lampyridæ.*

It is commonly supposed that the female only is luminous. It has been observed, however, that the male also has the power of emitting light, although certainly to a much less degree than that possessed by his mate. The female is wingless, and remains stationary in her secluded home, whilst the male enjoys his more airy existence. In some counties glow-worms abound during the hay harvest in cut grass, and may be found on summer evenings amongst the low herbage of banks and hedgerows.

Gilbert White informs us that the glow-worm eats snails, upon which he fed some of these insects for many days. Their eggs are luminous, and under favourable circumstances the larvæ are about twelve months in attaining the perfect state. It is a curious fact that the glow-worm has the power of extinguishing or withdrawing its light when threatened by danger;

and we have observed that it does not retain its brilliancy many days when kept in an artificial state. The smallest print may be read by moving one of these insects along the lines. It has been celebrated by Southey, in his poem of "Madoc," and Cowper also was inspired by the same insect.

To a small Coleopterous family, BRACHELYTRÆ, belongs a common beetle known to children by the name of DEVIL'S COACH-HORSE (*Staphylinus erythropterus*). Although of such unprepossessing name and appearance, this insect seems to be of a remarkably harmless character. The poor creature is destitute of any means of defence beyond the power of emitting, when touched, a disagreeable fœtid odour. It turns up the lower part of its body in an offensive way when assailed, but has no power of either pinching or stinging its assailant, the small fork-like projections at the extremity of its body being very weak, and simply rudimentary in their nature. It runs and flies with equal agility, and feeds on living insects, also deriving nutriment from decaying animal and vegetable substances; but, unlike most insects of the same order, it does little injury to our living vegetable property. The majority of species live in the earth, amid manure and putrid substances; some, however, exist on fungi and rotten wood; others, again, are abundant under stones, and a very small kind is found among the petals of flowers. The wing-cases are red, and part of the



DEVIL'S COACH-HORSE
(*Staphylinus erythropterus*).

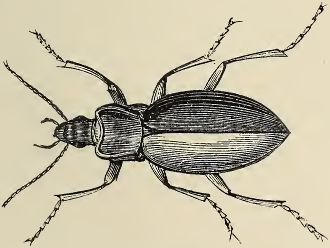
body is covered with a golden pile, but the general form is very unsightly, giving rise (in combination with its great speed in running) to the strange name whereby it is commonly known.

Our attention is now claimed by the *Coccinellidæ,* a family containing our pretty familiar friend, the Seven-spotted Red Lady-bird (*Coccinella septempunctata*). There is a common error respecting these little beetles, which is, that they injure vegetation. The lady-bird, however, feeds almost exclusively on the *Aphis* (plant louse), and in clearing our plants of these really destructive creatures, does infinitely more good than harm in the vegetable world. The writer at one time finding a conservatory infested by blight (*Aphides*), collected a great number of lady-birds, and gave them liberty in the greenhouse. After a few days no trace of the aphides remained beyond some thousands of empty skins from which the lady-birds had sucked an ample meal, thus ridding the conservatory of a troublesome and most destructive inhabitant—a more effectual cure, indeed, for this nuisance than all the washing and smoking which had previously been tried. In the larva, as well as the perfect state, the lady-bird feeds exclusively on aphides, and never touches vegetable substances. There are many species of *Coccinellidæ,* varying with from two to seven spots on the elytra. The eggs are usually deposited in groups of twenty or more upon leaves where the aphis abounds, so that the larvæ,

SEVEN-SPOTTED LADY-BIRD (*Coccinella septem-punctata*).

when hatched, are in the midst of their prey. The seven-spotted lady-bird is the most common species, and its larva, being of considerable size, devours a vast number of aphides. Thus we learn not hastily to condemn as destructive any living beings simply from the fact of finding them abundant in the neighbourhood of certain unhealthy objects, where, indeed, a wise Providence, may, in many cases, have placed an apparent enemy, expressly for the purpose of curing the evil of which at first we supposed it to be the cause.

The species of the family Carabidæ are easily distinguished from those of the Scarabidæ by the shape of the thorax, which is much narrower where it joins the wing-cases than is that of the Scarabus, giving the former beetles the appearance of having distinct neck and shoulders, whilst the form of the Scarabus is more uniformly oval. Of the Carabidæ, we are informed that one collector has brought together



BLUE BEETLE
(*Carabus violacea*).

as many as 2000 species. They are chiefly found under stones; and, on account of the hardness of their elytra, are enabled to creep through narrow fissures, and to bear great weights without injury.

One of the most familiar species is the Blue Beetle (*Carabus violacea*). The elytra are of a beautiful violet colour, with copper reflections. It is very voracious, and almost entirely an animal feeder, attacking many of the herbaceous species, which have little chance of escape when once within the grasp of its powerful mandibles.

The little Bombardier Beetle is a common victim of the blue beetle. The Bombardier Beetle (*Brachinus explodens*) is also one of the Carabidæ; and although the larger species are tropical, there is a smaller kind, very common in England. It derives its name from a singular power it possesses of emitting, when touched, with a slight explosive sound, a bluish vapour of very pungent scent. This minute Bombardier has been known, when irritated, to fire its artillery as many as thirteen times in succession. The explosion is caused by the sudden emission of a volatile fluid from the anus, or lower extremity of the body.

BOMBARDIER BEETLE (*Brachinus explodens*).

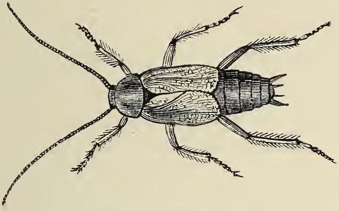
The entomologist is familiarly acquainted with a vast number of beetles both terrestrial and aquatic, which, although very common to him, are, for the most part, quite strangers to those persons who have not made a separate study of Coleopterous insects; and as our object is rather to supply the reader with the history of the insects with whose external forms he is already familiar, than to introduce him to strangers, we have purposely omitted noticing many species which, although really very abundant, are still unfamiliar to the generality of persons unacquainted with the science of entomology.

ORDER II.

ORTHOPTERA (*Straight-Winged*).

INSECTS of this order, which somewhat resemble the Coleoptera, differ from beetles in the softer covering of the body, as well as in the more membranous character of the anterior pair of wings, which partake both of the horny texture of the elytra of beetles and the membranous wings of the Hymenoptera. The most common Orthoptera of this country may be divided into the five following families: *Blattidæ* (COCKROACHES), *Forficulidæ* (EARWIGS), *Gryllidæ* and *Achetidæ* (CRICKETS and GRASSHOPPERS), *Sibulidæ* (DRAGON FLIES).

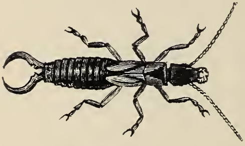
The COCKROACH (*Blatta orientalis*), although in external appearance so much like a beetle as to be commonly and erroneously called the *black beetle,* has, in reality, so little in common with the Coleopterous insects, that naturalists have placed it under a distinct order. It has no elytra (wing-cases), being furnished only with short, straight, elementary wings, which do not even afford it the power of flight. The cockroach is named *Blatta orientalis,* from having been originally a native of the West Indies. So long, indeed, has it been domesticated among us, that the period of its introduction into Europe is very uncertain. It is nocturnal in its habits, and feeds voraciously upon any animal matter which may be left in its way—not only devouring our stores, but leaving an offensive odour upon everything it crawls over, justly deserving its character as the pest of our kitchens. To the naturalist, however, it possesses, at least, one interesting feature. Instead, like most other insects, of depositing its eggs singly, they are collected together at once in a large, horny, bean-shaped case as they emerge from the body of the female. This capsule is securely glued by the mother in situations



FEMALE COCKROACH
(*Blatta orientalis*).

the most favourable for her future nursery. Some foreign species of this insect attain several inches in length, and are so fearfully voracious as even to attack the extremities of dead and dying human beings. It may, however, in some measure modify our vindictive feelings against this insect to know that it is not without its own personal enemy in the form of a parasite, named by Fabricius *Evania appendigaster*, which will, probably, tend in time to reduce the number of our household enemies.

Although some naturalists have placed the Earwigs (*Forficulæ*) in the order Coleoptera, we have the authority of Latreille for including them among the Orthoptera—their *tegmania* (wing-covers) being of a very different texture to the elytra of beetles. A popular prejudice prevails against these insects, founded on an erroneous belief that they get into the human ear. and thence into the brain—a most incorrect and unphilosophical notion, as, were it not for the barrier formed against the entrance of any living creature, by the bitter wax contained in the ear, there is no passage through the drum of that organ which could admit of the passage of the most minute creature in existence. From its shy nature, the Earwig (*Forficula auricularia*) may have occasionally taken shelter in the external ear-folds of persons sitting or lying where these insects abound.

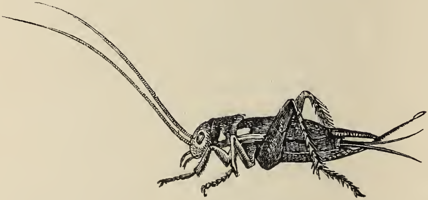


EARWIG
(*Forficula auricularia*).

When deprived of their natural vegetable food, earwigs have been known to devour the dead bodies of their own kind; but they feed chiefly upon fruits and flowers, among which they commit great ravages. The dahlia, especially, cannot be cultivated with success where this garden enemy is abundant. We cannot give a better receipt for reducing their numbers than that of a quaint old English writer, who says:—"The Englishwomen hate them exceedingly, because of the flowers that they eat and spoyl, and they lay snares for them thus: they set in the utmost void places ox-hoofs, hogs-hoofs, or old cast things that are hollow upon a staff fastened into the ground, and these are easily stuffed with clothes or straw, and when by night the savages creep into them to avoid the rain or hyde themselves, these old cast things being suddenly taken away and shook forth, a great multitude of them fall, and are killed with treading upon them." Our ill-feeling towards these creatures may be in some measure modified by an amiable characteristic which belongs to them, namely, their maternal affection. The eggs, which are deposited in sheltered situations, are tended by the mother with great assiduity. She accompanies the young brood about, like a hen with chickens, wherever they may choose to roam; and, to complete the resemblance to our feathered friend, the earwig's young have been observed to take shelter under the parent's body. Unlike the beetles, this insect is active, and feeds in the second stage of transformation. There are six or seven species of the earwig which are inhabitants of this country, but little is known as yet of their distinctive habits. The wings are of tolerably large size, although seldom seen on account of being folded both longitudinally, and transversely, so as to occupy a very small space.

To the family Gryllidæ belong the GRASSHOPPERS and LOCUSTS.

The HOUSE CRICKET (*Acheta domestica*) is essentially nocturnal in its habits, and, being one of the *luci fugæ* (those insects which escape at the approach of light), seldom ventures forth until darkness and silence encourage its exit from the snug nooks and crannies which form its daylight lodgings. As may well be imagined, from the hot and dry places they frequent, these insects are of a very thirsty nature, and attack, to quench their longing for liquids, whatever is moist, often gnawing holes in wet clothes which are hung up by the fire to dry. The crickets, indeed, are little less destructive in the larder and kitchen than is the cockroach, with which they appear to live on friendly terms —never, when they can obtain other food, preying one

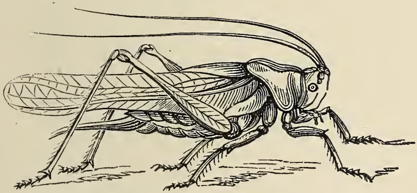


HOUSE CRICKET
(*Acheta domestica*).

on the other. The chirping noise they emit is the result of no vocal power, being caused by brisk friction of the wing-covers together, and may generally be silenced for a while by any rival music. The cricket probably establishes its dwelling among us when our houses are fresh from the builders' hands, and the mortar is sufficiently damp and soft to admit of an easy entrance to these insects, which multiply so rapidly that after a few years we cease to give them welcome, notwithstanding all that poets have sung in their praise.

To the order upon which we are now engaged belong the *Locustidæ* (Locusts). As, however, these insects are very rare in most parts of England, it would be inconsistent with our present purpose to notice them among *Our Common Insects.*

The Great Green Grasshopper (*Gryllus viridissimus*), which is common in the neighbourhood of London, is the largest British species of its order. Grasshoppers are distinguished from crickets by the roof-like position of the wings, which in the latter insects are folded horizontally. De Geer (to whose close observations



GREEN GRASSHOPPER
(*Gryllus viridissimus*).

we are indebted for much valuable information as to the habits of these insects) informs us that the peculiar sound emitted by them is caused by friction together of the thighs and "strong, prominent nervures," which surround the margin of a drum-like membrane stretched across the right wing-cover of the male insect. Like the earwig, the grasshopper is very similar in the first two stages of transformation to the perfect insect; the only difference being that in the first and second periods the wings are rudimentary, whilst in the perfect insect they are fully developed.

ORDER III.

HEMIPTERA (*Half-Winged*).

THE INSECTS which compose this order possess wings intermediate between the horny covering of beetles and the membranous wings of flies. The name *Hemiptera* (half-winged) is given from the fact of the wings not meeting together when at rest, but having some part of the margin of one wing-cover folded over the other, thus producing the appearance of being *halved,* or split longitudinally.

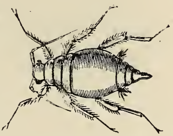
These insects feed by means of a sucker, which is bent under the head and thorax, except when this organ is thrust into whatever substance constitutes the insect's food.

The order *Hemiptera* contains three families, wherein we shall recognise some familiar species. These are: 1. Cercopidæ (*cuckoo spit*); 2. Aphidæ (*honey-dew*); and 3. Cimicidæ (*bugs*). To the first belongs the Cuckoo Spit Fly (*Cercopis spumaria*), which produces, while in the larva state, that frothy matter so frequently seen adhering to plants, blades of grass, and especially willow trees in spring and early summer. The perfect insect has four wings of leathery texture of a brown colour, the first pair with a white spot and pale double band. The common error that this frothy matter is produced by the cuckoo probably originated from the fact of the insect making its appearance about the same time as the bird from which its popular name is derived. Another common name by which, in some counties, it is known, is Frog-hopper—an appellation, indeed, less likely to lead to error than the first, by which we have introduced it. Upon removing the froth wherewith it is enveloped, the larva, which is a

CUCKOO SPIT
(*Cercopis spumaria*).

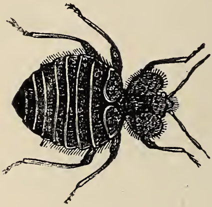
very beautiful and curious little creature, will be readily discovered. Its power of leaping is very great. The larva differs from the perfect insect in being without wings.

The second family, *Aphidæ,* contains the so-called green blight (*Aphis*), often also named HONEY-DEW. There is, perhaps, no visible insect so rapidly multiplied as this garden enemy. So great, indeed, is the rate of its reproduction that, from a single aphis, in the space of three months it is calculated that 10,000 millions of millions may be generated. The species which commits the most serious ravages is the HOP FLY (*Aphis humuli*), upon the presence or absence whereof depends the amount of hop duty paid to the English Government. A large proportion of these insects never have wings, but at certain seasons some individuals acquire these appendages. A curious fact peculiar to the aphis is, that it produces young *in the perfect state* in alternate generations. The sweet fluid called honey-dew (which is always found in the vicinity of this insect) exudes in limpid drops from two horn-like tubes at the posterior part of its body, and forms the favourite food of some species of ants. The *Aphis rosæ* (ROSE LOUSE), which is the most destructive in the conservatory and garden, is much kept under by the lady-bird, which feeds very extensively upon it.



HONEY-DEW (*Aphis*).

The third family, *Cimicidæ,* contains our disgusting town pest, the BED BUG (*Cimex lectularius*). Well disposed as we feel towards the insect world in general, there is little to be said positively in favour of these offensive creatures. They are, however, the passive means of making us more watchful as to the cleanliness of our homes in order to avoid the presence of such unwelcome visitors. The Bed Bug was formerly a comparatively rare insect in England, where it was known as the *Chinche* (wall louse), its more recent name of BUG having been given to it as characteristic of the horror wherewith it inspired our ancient countrymen, the word *bug* signifying in the Celtic language a ghost, goblin, or anything which occasions *terror by night.* Although apparently an apterous or wingless insect, the bug is really furnished with a pair of flat, rounded, and movable appendages, which are evidently the elements of a pair of wing-covers. It is, however, at all periods destitute of the power of flight. Most probably it was originally introduced into England in timber brought from the Continent to repair the destruction occasioned by the great fire of London in 1666.



BED BUG
(*Cimex lectularius*). Magnified.

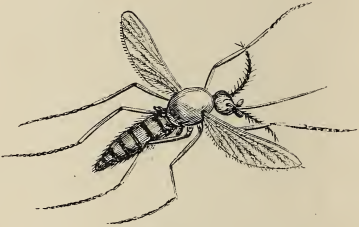
ORDER IV.

DIPTERA (*Two-Winged*).

ALTHOUGH more annoying to mankind personally than any other order of insects, the *Diptera* well-nigh compensate for their bloodthirsty assaults by the good service these little creatures do us in cleansing the earth from the animal and vegetable impurities whereon most of these insects feed. The *Diptera* have only two true wings. They are supplied, however, in the place of hind wings with a pair of poisers, which keep their owner steadily balanced in the air, but do not seem to assist its progress during flight.

Our most familiar *Diptera* are members of four families: 1. Culcidæ (*Gnats*); 2. Tipulidæ (*Daddy Longlegs*); 3. Tabanidæ (*Gad Flies*); and 4. Muscidæ (*House Flies, Bluebottles, &c.*).

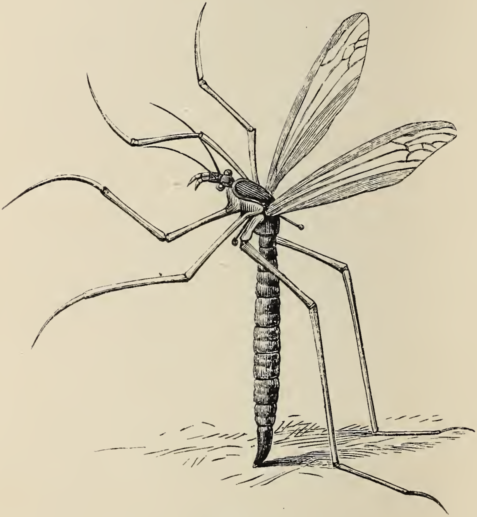
When the gnat bites us the sharp pain we feel is inflicted by a proboscis, or fleshy tube, which is furnished with several minute lancets, wherefrom a poisonous fluid exudes, which is instilled into the wound, causing the blood to flow more rapidly than would otherwise be the case, but giving great pain to the victim of this little creature's rapacity. We have, however, often supplied it with a good meal at our own expense for the sake of watching the curious manner in which the blood has been sucked up into its stomach from our hand.



COMMON GNAT
(*Culex pipiens*). Magnified.

Kirby and Spence inform us that in 1736 gnats were so abundant in the neighbourhood of Salisbury that the dense clouds they formed in the air by their immense numbers were mistaken for columns of smoke, giving rise to a report that the Cathedral was in flames. The disagreeable noise made by gnats is no vocal sound, but arises from the rapid movement of their wings, which the Baron Latour tells us are vibrated 3000 times per minute. Although the gnat is an aerial being, it passes its existence in water during the larva state. Soon after coupling, the female takes her station on some floating substance, and deposits her eggs in the water, after having previously formed them by her hind-legs into a curious boat-shaped mass, constructed to float on the surface of the water. The eggs are hatched in about a couple of days; and in fifteen days the larvæ assume the pupa state, and rising to the surface at the time of their final change, burst the pupa skin, which serves in every sense for a *lifeboat* to the future gnat, which sails about the surface of the water, the head and a portion of the body serving as mast and sails to this little craft until the proper period arrives for this insect to quit it for a more aerial existence. Great numbers of gnats, however, suffer shipwreck and are drowned at this period, otherwise we should probably be overwhelmed by their numbers, and become, indeed, the miserable victims of their insatiable voracity. In warm weather the larvæ swarm in our rain-water butts, wherein they may be seen rising, with their tails upwards, for the purpose of respiration, and diving down again, with the most comical movements at the least disturbance, as if sportively to elude every attempt to capture them.

The second family of Dipterous insects is that of the TIPULIDÆ, among which one of the most familiar species is the DADDY LONGLEGS (*Tipula oleracea*), also known as the CRANE FLY. These insects, although considerably larger than the gnats, are much less personally annoying to mankind than most of the Culicidæ family, whose weapon of offence is longer and more formidable in every respect than that of the Tipulidæ, in which the proboscis contains two lancets instead of four, and is less calculated for blood-sucking than that of the gnats. As far as we are personally affected, the Longlegs is totally harmless: but to our crops, especially grass, the larva of the crane fly is most injurious, destroying whole districts of meadow land by feeding upon the roots, thus rendering it unfit to produce our needful supplies for cattle. It is also destructive to wheat and clover, especially in marshy land. These insects deposit their eggs in the soil by means of a pointed sting-like instrument, from which



CRANE FLY
(*Tipula oleracea*).

they are easily pressed, in the same way as the stone can be squeezed from a ripe cherry. They are extremely minute and black, like grains of gunpowder, and are laid by the fly while in a perpendicular position. It is while in the larvæ state that the insect is so destructive to our herbage. When caught by the legs, these members are separated from the body with the greatest ease, and the insect flies away apparently as unconcerned and unhurt as if in possession of its natural number of limbs —a provision, doubtless, for the poor creature's escape, as, being unprovided with a sting or any other means of defence, it would otherwise have no means of escape from its enemies, and the good purpose (notwithstanding its destructive habits) which, with all created beings, it doubtless fulfils in nature, would thus be lost to us. It is very likely that, by perforating the soil, and rendering it light, the good done by this insect may, in the main, more than counterbalance the great evil of which it is the cause.

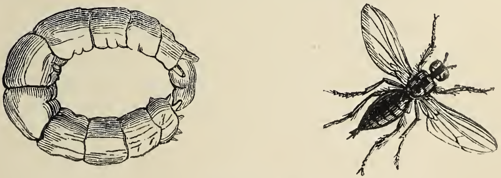
We now direct our attention to the MUSCIDÆ, which contains a greater number of familiar species than any other family of Dipterous insects. The common HOUSE FLY (*Musca domestica*), although occasionally very troublesome in our dwellings, cannot but claim our interest from the life-long familiarity with which it has established itself in our homes. The eggs of this insect are generally deposited in horse's dung, for which reason flies are always most abundant in the neighbourhood of stables and hot-beds. The wonderful adaptation

HOUSE FLY (*Musca domestica*).

of form to function which pervades the animal kingdom is in no instance more beautifully exemplified than in the formation of the fly's foot, which naturalists, after a series of researches, have found to consist of two or three membranous suckers, convex above and hollow beneath, constructed to cause atmospheric pressure upon the exterior surface, which enables this insect to walk against gravity with the back downwards upon ceilings, and also to climb up smooth surfaces. Sufficient numbers of house flies, however, are captured during their airy excursions by birds, as well as through being entangled in the cunning traps laid by spiders. Much as we are annoyed in England during certain seasons by house flies—when we consider what a pest they are in many foreign countries, especially in Spain and the South of France—we have reason to be thankful for the comparative immunity we enjoy from this insect's irritating persecutions. In writing of Languedoc and some part of Spain, Mr. Spence says, "If I farmed these countries, I think I should manure four or five acres every year with dead flies;" and in the olive districts in France the inhabitants are obliged at every meal to keep a person expressly for the purpose of driving away these tiny tormentors.

Disgusting as are our associations with the flesh fly or Bluebottle (*Musca vomitoria*), it is well to consider how useful this fly is by depositing its eggs in putrifying animal matter, which is so speedily devoured by the larvæ (maggots), that Linnæus informs us the produce of three female blow flies could devour the carcase of a horse as quickly as a lion would do—a fact easily believed when we learn that one fly may be the mother of 20,000 young ones. Thus, if considered only as scavengers, these insects are a greater blessing to us than otherwise, as without their assistance we should be victims to impure odours and the innumerable evils arising therefrom. When in the perfect state, the Bluebottle is anything but a filthy feeder, being fond of sugar and the sweet juices of flowers, about which on sunny days it may be seen to hover as gaily as the bee, and, indeed, presenting a much more brilliant aspect than its more interesting neighbour of the hive—the bluebottle's bright metallic hues, as they reflect the sunlight, rendering these insects far from a disfigurement to the parterre.

Another well-known species of the family Muscidæ, the Cheese-hopper (*Piophila casei*), must not be confounded with the cheese-mite, which belongs to the order Acaridæ, and, wanting the characteristics of true insects, should be separated from the class Insecta, and placed in that of the Acaridæ. The cheese-hopper derives its popular name from its power, while in the



CHEESE-HOPPER
(*Piophila casei*). Larva and fly.

larva state, of making enormous leaps; and its mode of doing so is very curious. When about to leap, it first raises itself on its tail, then bending into a circle, and suddenly letting go its hold, is projected to an incredible height in proportion to its size.

Unlike most other insects, the chief breathing tubes of the cheese-hopper are situated near the head instead of along the sides of its body; and for this reason, lest, while boring for food, the particles of cheese should suffocate it, the insect has the power of spreading a valve-like covering over the breathing orifice, thus being enabled to feed without inconvenience. We find the grub transformed to a small Dipterous fly, with dark spots on the wings. Unlike the cheese-mite, the *hopper* is never found in old and dry cheese, but is common in that which is badly pressed and moist, known to the dairy-maid as being attacked by "*wet-rot*," in distinction to "*dry-rot*," which is caused by mites.

We close our history of familiar Dipterous insects with the BREEZE HORSE FLY, or BOT (*Œstrus Clarkii**), which attacks both man and beast with such pertinacity, that it resists alike lashes from the horse's tail and all human efforts to drive it away, rather suffering itself to be crushed during its meal than to resign a single drop of its favourite beverage. The proboscis is a fleshy tube like that of the gnat, supplied with several lancets, wherewith it cuts an incision in its victim's flesh, and, converting this formidable apparatus into a syphon, each fly carries off many drops of blood. It is a curious fact that the females alone are endowed with these bloodthirsty peculiarities, the male frequenting flowers, upon the juices whereof it is content to feed. The larvæ reside in dung and under ground. They do not appear to be the cause of much mischief; but, on the contrary, take their part in clearing away animal and vegetable impurities, thus justly claiming of us the forgiveness of a multitude of offences. The breeze fly glues its eggs on the hair of the horse, instinctively selecting some part which it can reach with its tongue; and, after depositing 50 or 100 eggs the parent fly soon perishes. It is likely the horse feels some inconvenience from this glutinous matter stiffening his coat, and, licking the part, takes into his mouth, and thence into his stomach, the newly-hatched grubs, which are afterwards voided, when they bury themselves in the earth, and remain torpid for a few weeks. The larvæ, which are also called BOTS, are often found crowded in great numbers in the horse's stomach. They appear, however, to produce no mischief in this position, but often give rise to severe coughs while in the animal's throat.

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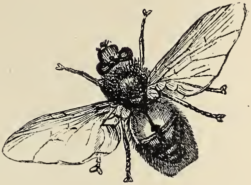
* Bracy Clark, F.L.S.



HORSE GAD FLY*
(*Œstrus Clarkii*).

ORDER V.

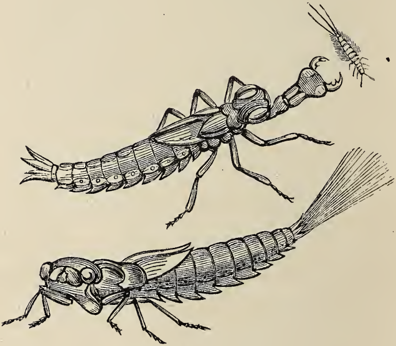
NEUROPTERA (*Nerve-Winged*).

INSECTS of this order differ from the DIPTERA and HYMENOPTERA in having the wings closely intersected with nerves, so that any injury to these delicate members is doubtless attended with some amount of suffering to their possessor; whilst, on the contrary, with the bee and fly the wings may be cut or torn without producing pain. There are many British families of Neuropterous insects; suffice it, however, for our present object to notice only those which are generally known, namely the LIBELLULIDÆ (*Dragon Flies*), EPHEMERIDÆ (*May Flies*), and PHRYGANIDÆ (*Caddice Flies*). Most of these insects passing their larva state in water, and the perfect Neuroptera being quite harmless, the members of this order may, perhaps, be considered among the least offensive of the insect creation.

From its graceful movements and attractive appearance, the French have gallantly given to the DRAGON FLY the name *Demoiselle.* The collector, however, is disappointed by finding that this brilliant creature loses all colour when deprived of life. We may keep in our glass cases butterflies, moths, and beetles, with little detriment to their original beauty; but this once brilliant creature appears in our entomological museum little more attractive than a dead leaf or stick. During the larva state it is entirely aquatic. The mother drops her eggs in lakes, ponds, and pools; and may be seen, in the autumn and late summer months, gracefully skimming the surface of the water for this purpose. So

DRAGON FLY.
Perfect state.

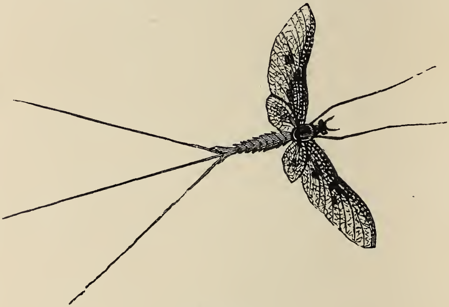
great is its rapidity of flight, that it is said to outstrip the fleetest birds; and the human eye can with difficulty trace its movements, which differ from those of any other insect during flight, as it is able to fly forwards and backwards, to the right and left, and, indeed, in all directions, without turning—a peculiarity which enables it to escape the pursuit of many birds which would otherwise prey extensively upon it. In the perfect state it devours various flies, occasionally feeding upon butterflies and insects larger than its own head; so great, indeed, is its boldness and voracity that, when captured, it will eat with avidity a fly held to its jaws, continuing the meal with perfect composure as long as supplied with this kind of food; and even with the head and chest separated from the body, this insect gourmand will eat with apparent unconcern and good appetite. In the larva state it is equally voracious, attacking fish, water



LARVA OF DRAGON FLY.

insects, and any living being which may come in its way, not excepting its own kind in case of scarcity of other provision. We have endeavoured to keep the larvæ of Dragon Flies in our aquarium for the sake of watching their transformations. In a few days, however, finding our fish with holes in their sides, our snails sucked out of their shells, and our beetles, &c., reduced to mere skeletons, we were obliged to banish the Dragon-fly larvæ, and have never since ventured to keep them with other living beings. In the larva state their powers of locomotion are very limited; so that other larvæ and insects endowed with more agility have, in a natural state, some chance of escape from these universal enemies, whose progress is effected by a series of jerks, caused by the forcible ejection of jets of water from the posterior extremity of the body. Their final change is indicated by the increasing transparency of the larva, beneath which it is easy to distinguish the brilliant eyes of the future Dragon Fly.

The Ephemeridæ (*May Flies*) are thus named from the short duration of their lives, which, in the perfect state, does not extend beyond five or six hours—the common May Fly (*Ephemera vulgata*) being generally hatched about six o'clock in the evening, and dying before twelve at night. At the season when they make their appearance in the perfect state, they are often so abundant that the air for miles is filled with them. Among fish the trout and grayling are peculiarly fond of May Flies; and among birds the goat-sucker regards them no less as a *bonne bouche*. One fine evening, while standing on the bridge which crosses the Rhine at Coblentz, we witnessed a pretty and interesting sight, in vast numbers of these birds whirling and gliding rapidly and gracefully in pursuit of myriads of Ephemera, which filled the air like floating white flower-blossom in all directions. Réaumur graphically describes a scene like this by saying that the May Flies had the effect of a snow-storm when the flakes are of the largest size, with the smallest space between them. Although the life of these insects in the perfect state is so short, they remain two or three years in the water during the larva condition ; and may we not reasonably conclude that, according to the Almighty Creator's benevolent provision for the happiness and welfare of all his creatures, these insects probably enjoy in their earlier stages of existence a degree of pleasure sufficient to compensate for their transitory existence while on the wing? Is it not possible, too, that their "little day" may



MAY FLY
(*Ephemera vulgata*).

appear to them as long as our three score and ten years?

The PHRYGANIDÆ (*Caddice Flies*), although sometimes placed in a distinct order (TRICHOPTERA) on account of the hairy covering of the wings and body, belong more correctly, we think, with Latreille, to the NEUROPTERA, in which order we have placed them by his authority. These curious insects are abundant in well nigh every country pool and pond, and are used by the angler as a successful bait for many kinds of fish. The large CADDICE FLY (*Phryganea grandis*) lives during the larva state in a curious cylindrical case, open at each end, constructed of bits of stick, reeds, the shells of young water snails, and sand, curiously united by means of silken threads and a glutinous cement secreted by this insect, which bears about its dwelling much in the same manner as a snail carries its shell. Different species, however, seem to have their peculiar tastes as to the materials they select for the construction of their respective habitations. The Caddice Worm feeds upon dead water snails, fish, and any animal offal which chance may throw in its way. It is also destructive to many living occupants of the pond.

LARGE CADDICE FLY
(*Phryganea grandis*).

CASE OF THE CADDICE FLY.

ORDER VI.

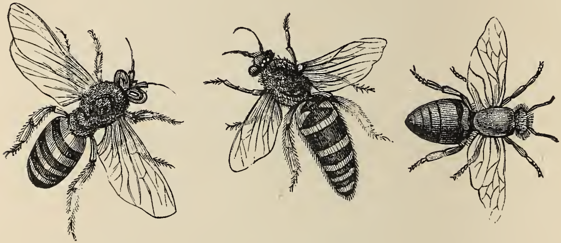
HYMENOPTERA (*Membrane-Winged*).

HYMENOPTEROUS insects are distinguished by the possession of four membranous wings. During flight, however, the posterior and anterior pair are hooked together, giving their possessors the appearance of Dipterous or two-winged insects. The insects of this order are remarkable for the great development of their *instinctive* faculties. Their locomotive power is also very considerable. The families wherein we find the most familiar species are the Formicidæ (*Ants*), Vespidæ (*Wasps*), and the Apidæ (*Bees*).

With the exception of the hive bee, there is, perhaps, no insect whose history is more replete with interest than that of the ANTS (*Formicidæ*), to which family belong many foreign as well as native species, each (especially the termites or white ants of Bananas) demanding careful study and attention. It is needful, however, at present, to confine our attention to our native species, whereof five have been described by Gould: 1. *Formica rufa* (Hill Ant); 2. *F. fuliginosa* (Jet Ant); 3. *F. rubra* (Red Ant); 4. *F. flava* (Yellow Ant); 5. *F. fusca* (Small Black Ant). We have lately seen these little creatures in dwelling houses on the south-east coast of England, where these very minute ants assembled by thousands on the contents of the larder.

The community of ants, like that of the hive bee, is composed of males, females, and neuters, which undergo regular transformations, the females continuing in the pupa state about six weeks, whilst the males remain only a month in this condition. De Geer has noticed that the females shed their wings as soon as they become mothers. The males and neuters are also furnished with these appendages. Solomon has bid the sluggard "go to the ant" for an important moral lesson; and, indeed, the most active among us might gain from these insect architects much useful knowledge, especially in the artistic construction of our dwelling houses. In describing their habitations we select, as the best example, the YELLOW ANT'S home, the construction of which is, perhaps, more elaborate and full of design than that of any other native species. These insects are not, indeed, over-nice in the choice of materials whereof to build their habitations, and make use of sticks, small stones, dead leaves, and stubble, heaped together apparently without order or design, but, in truth, carefully and ingeniously arranged, with devices both to resist change of weather and the attack of enemies. The exterior of these dwellings is always dome-shaped, with apertures of different shapes and sizes leading, by serpentine galleries, into the interior. Hüber has discovered the interesting fact that the yellow ants guard their nests carefully by day—taking the precaution to close all apertures before the night; and he has also observed that the large entrances which are needful for the day's business are gradually (even hourly) diminished towards evening—this wonderful process being accomplished by the ants drawing minute bits of wood across the openings, and repeating the process by layers, finally filling up all crevices with dried leaves and bits of straw. The dome contains regular and convenient chambers communicating with each other by galleries. A remarkable fact in the history of ants is the manner in which they wage warfare with, and even carry away captives from among, their black brethren the negro ants (*F. fusca*). Like the honey bees, the ants have "queen and officers of sorts." For a more detailed account, however, of these wonderful little creatures, we refer the reader to Mr. Newman's "Familiar Introduction to the History of Insects," whence, indeed, we have been supplied with some of the interesting facts now narrated. It would, however, be an omission not to notice one of the most curious parts in the ant's domestic economy, namely, her *cow-keeping*—a fact which, if not well authenticated, would indeed be well nigh beyond our powers of credulity. Linnæus, however, tells us that "the ant ascends the tree that it may milk its cows." The *milch cattle* alluded to are the little green insects commonly called blight (*aphides*), which infest many trees and plants—the species (*Aphis quercus*) from which the ant derives her supplies being peculiar to the oak. The fluid called milk is clear and sweet, somewhat like honey, and popularly called *honey-dew*. It issues in limpid drops from the body of the aphis, being probably secreted from the sap of plants, which it infests and sucks continually. So highly, indeed, is this *cow-insect* prized by the ants, that they actually collect and store its eggs, nursing and watching them with the greatest care, and even hatching them for future supplies. It is upon the neuters or workers that the nursery duties devolve. To prove these curious facts we have the testimony of the younger Hüber, who, for the sake of closely observing the ant's proceedings with the aphides, procured a box with glass top and sides, wherein he placed some eggs of the aphis which he had secured from a yellow ant's nest situated under an oak. This box, with free access to the ants, he placed at the foot of the tree. The ants did not forsake the eggs for a minute—covering them with earth, occasionally turning and moistening them (a necessary process), and finally producing from them a promising brood of aphides. Of their own eggs and young the ants are equally careful; and it is an interesting and affecting sight, when a nest is disturbed, to watch these affectionate creatures carrying away their helpless little ones with the greatest speed and caution to the nearest place of safety.

Turn we now to the Apidæ (Hive Bees). For its interesting habits, especially in the government and construction of its habitation, the Hive Bee (*Apis mellifica*) is pre-eminent among insects. It is remarkable for the division into societies of the members which form its community—these societies, consisting of one female (the queen), several hundred drones (males), and about 20,000 neuters (workers). The wax whereof the comb is constructed is secreted within the body of the bee, and issues in thin flakes from segments of the abdomen, when, after being kneaded by the insect's jaws, it is worked into form according to the wonderful instinct wherewith these interesting creatures are endowed. The drones, which take no active part in the domestic arrangements, are not suffered to encumber the hive,



Male. Female. Neuter.

HIVE BEE

(*Apis mellifica*).

but are stung to death before the winter sets in, in order to save for their more industrious brethren food which otherwise would have been uselessly consumed. The bee has its regular larder apart from the *nursery cells*, which are devoted solely to the reception of the eggs and young, whose nursing and rearing entirely devolve upon the neuters. Another remarkable part of the history of the bee kingdom is the fact of its subjects being so essentially monarchical that, when more than one queen is hatched, the superfluous royal pupæ are stung to death by the first transformed. For this purpose the cocoon (a case serving generally for the protection of insects during the pupa state) is imperfectly formed so as to admit of the easy destruction of all rival monarchs. When the hive is over-populated, colonies of young bees are sent out, with their respective queens, in search of independent habitations: these are the swarms, several of which are often separated from one hive during the spring and summer months. When by any accident a hive is deprived of its queen, no drones are massacred until a successor to the throne has been elected; and it is a curious fact that a few days previous to each swarm scouts are sent out in quest of a new habitation for the young colony, so that, should a hive stand vacant, a swarm will sometimes send out these scouts to take possession of it; but in their more artificial life among us the bees are generally taken and hived by us for our own profit and convenience.

Our attention is next claimed by the VESPIDÆ (wasps). The common WASP (*Vespa vulgaris*) is social in its habits

Its communities, however, although less extensive than those of the hive bee, consist also of males, females, and neuters. There are two sorts of females, the large and the small. The larger kind, equal in size to six workers, is produced later than the males, and appears in the following spring, when these bulky ladies should be destroyed to prevent the foundation of future colonies of wasps. The small females, which are not larger than the workers, lay only male eggs. The female wasp is more industrious than the indolent queen bee, who exacts the unwearied deference and attention of the whole hive. Our lady wasp, if she have the good fortune to survive the winter, works vigorously in the spring, without the help of servant or slave, and by her own unaided labour hollows out the cave which is to form her summer home. The nests are constructed of layers of hexagonal cells—one row being joined to the under side of another. The top is attached to the under part of a branch, or to the roof of the hollow wherein they are built. They are composed of bits of wood, bark, &c., detached by the wasp's jaws and reduced to a pulp, which, when spread out and dried, forms a grey paper-like substance. The wasps of this country do not store honey, but feed chiefly upon fruits, various flies, and decaying animal substances. Destructive as the wasp doubtless is to some of our property, we must admit that it is a much maligned insect. Who among us does not immediately rise in arms against the unfortunate insect which enters our domestic circle simply with the intention of taking its tiny portion of our abundant delicacies? We have the support of experienced naturalists in stating that the wasp does not attack or sting unprovoked; and our own observation has confirmed the fact that, if allowed peacefully to pitch upon us, without previous hunting or provoking, it most probably will do us no injury; and truly we subject ourselves to greater danger from these poor creatures when we leave them, by our violence, to crawl, wounded, about our floors and conveyances, irritated by pain, to thrust their weapon of defence in the first object which may come in their way. The wasp is not vicious, but simply resentful.

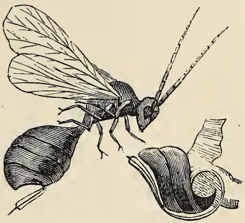
To the same family belongs the HORNET (*Vespa crabro*), which is considerably larger than the wasp, and constructs its nest in a very similar manner. The material, however, whereof it is composed is much coarser than that of the wasp's nest, and may be compared to the rough grey paper used by grocers to wrap up their wares. The Hornet's cells are fewer, and the columns supporting the layers proportionably stronger than those of the wasp's nest. We have had a favourable opportunity of observing the construction of one of these nests in a very beautiful and perfect specimen we once saw, which had been taken from the roof of a barn. It was attached by a footstalk, and defended at the base by a kind of fortification wall, with holes like gates to serve for the exit and entrance of the inhabitants. The hornet feeds upon other insects, especially bees, whose honey it also devours with avidity. Messrs. Kirby and Spence say that, although of such formidable aspect, the hornet, like the wasp, is not so "*ill-tempered*" as it is generally supposed to be. The sting, however, is an awful weapon, and in some instances may even be the cause of death. The hornet, however, like its smaller relation, very rarely attacks unprovoked.

Another family of well-known Hymenopterous insects is that of the BEMBECIDÆ, or humble bees. The HUMBLE BEE (*Bombus terrestris*) may be traced by the careful observer over clover field and flower garden to its retreat in some mossy bank, where it stores honey, and constructs its cells in a little chamber about 6in. or 8in. in diameter, reached by a long narrow passage not large enough to admit the entrance of more than two bees at a time. The community, which is small compared to that of the hive bee, consists also of males, females, and neuters—the females, like the wasps, being of two sizes, large and small. A curious fact in the history of these bees is, that the neuters carefully watch the queen mother at the time when she is about to deposit her eggs, and, by a strange instinct (probably to keep the humble-bee population within due bounds), seize and devour many of the eggs directly they are laid; and, doubtless, the poor mother has hard work to preserve her brood from the attacks of these household enemies. Unlike the hive bee, the male *bombus* is an active member of the society, taking his fair share in the reparation, cleansing, and other domestic duties of

HUMBLE BEE
(*Bombus terrestris*).

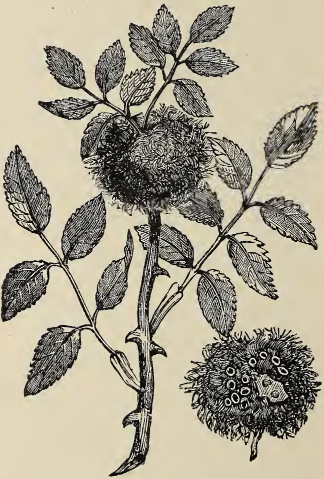
the nest. The societies consist in some species of as many as 2000 or 3000 individuals. At the commencement of the winter all but the larger females die. These, however, remain in a snug distinct chamber, carpeted with moss and grass, but unprovided, it appears, with food, which they probably collect for themselves whenever the weather is sufficiently mild to admit of their venturing forth in pursuit of it. Thus we often find these huge insects busy in our greenhouses and conservatories long after the smaller kinds have perished. During the first fine days of early spring the large females quickly excavate their nest, which they supply with a mixture of honey and pollen for the nourishment of the first brood.

A fourth family of Hymenopterous insects, with whose external appearance, perhaps, few general observers are familiar, is that of the CYNIPIDÆ (*Gall Flies*). Most persons, however, have noticed a curious excrescence called the oak-apple, which abounds on well nigh every British species of oak. This is produced by the OAK GALL FLY (*Cynips quercusfolii*), which, by means of a long spiral ovipositor, pierces the outer skin of the twigs and leaves of the tree—at the same time injecting a fluid which probably gives rise to this *morbid growth*. The Gall Fly is very small; its long ovipositor, which is coiled up within the body, is


OAK GALL FLY
(*Cynips quercusfolii*). Magnified.

invisible except when protruded. When cut longitudinally, the oak gall is seen to inclose a great number of granules, each containing a minute larva, which, when full grown, makes its way out of the gall and falls to the earth, where it completes its transformations. The species of Cynips which produces the gall from which ink is manufactured is imported from Smyrna.

A curious pink, mossy appearance, often seen upon the dog rose, called the *Rose bedeguar*, is also caused by



ROSE BEDEGUAR.

a species of Gall Fly (*Cynips rosæ*), which deposits its eggs, like the oak gall, in punctures through the cuticle of the plant, wherein a number of cells are formed, each containing a larva, which is protected from the winter's cold by a thick mossy covering surrounding it. These bright-hued little balls are peculiarly ornamental to our hedgerows when divested of their foliage and furnished with little else to render them picturesque during the winter.

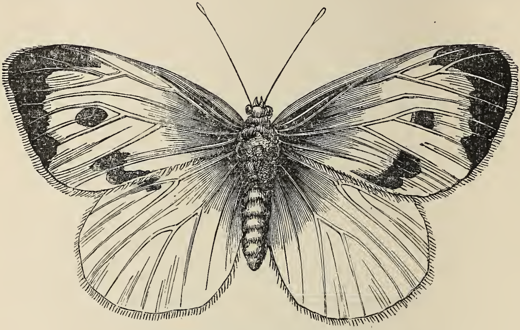
ORDER VII.

LEPIDOPTERA (*Scale-Winged*).

THIS very beautiful and extensive order has been divided into two sections, the Rhopalocera or Butterflies, and the Heterocera, or Moths. Lepidopterous insects are distinguished by the scaled character of their wings. To these scales, which amount to many thousands in a single individual, the insect owes its brilliant hues; the wing membrane, wherein the scales are arranged like tiles in a roof, being quite colourless. Butterflies and moths undergo three successive changes. When first hatched from the egg, which the mother deposits in situations favourable to the growth and nutrition of her young, the insect is said to be in the larva (*masked*) state —a creature feeding voraciously on whatever vegetable may have formed its birthplace. In most species the caterpillars (*larvæ*) shed their skins several times before arriving at the pupæ (*swaddled*) state, when, as this name implies, they somewhat resemble a child wrapped in swaddling clothes. At this period the butterflies attach themselves, by a silken skein across the body, to leaves, twigs, or any convenient place of shelter during this inanimate and helpless condition. The moths, when ready to assume the pupa form, construct a covering (cocoon) formed of a silk-like web (in some foreign species actually of silk), remaining within this stronghold until the pupæ are ready for their final change. Many moth larvæ, however, bury themselves in the earth when about to become pupæ ; whilst others make a kind of shroud of leaves drawn round their bodies.

Our most familiar butterflies belong to the five following families : 1. PAPILIONIDÆ ; 2. NYMPHALIDÆ ; 3. LYCINIDÆ ; 4. HIPPARCHIDÆ ; 5. HESPERIDÆ. Each of these families contains rare as well as common insects. Suffice it, however, for our present purpose to picture only those species which every dweller in the country will recognise as familiar friends.

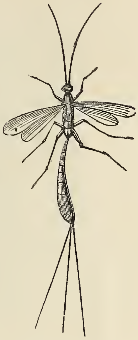
To represent the first family (PAPILIONIDÆ) we take the white cabbage butterflies. The LARGE CABBAGE BUTTERFLY (*Pieris brassicæ*) is abundant in all parts of England. The expanse of its wings is from 2½in. to 3¼in. It is white, with a small black patch on the upper side of the hind wings. The caterpillar is of a greenish yellow, with three yellow lines ; and the chrysalis green, spotted with black. Small birds destroy great numbers of these mischievous grubs; and one titmouse has been known to take five or six caterpillars to its nest in a few minutes. For this reason the gardener commits a great mistake in wishing to destroy these interesting little birds, under an erroneous notion that they are destructive to his crops, when, in truth, they are the means of saving the produce of his garden from depredations committed by real enemies



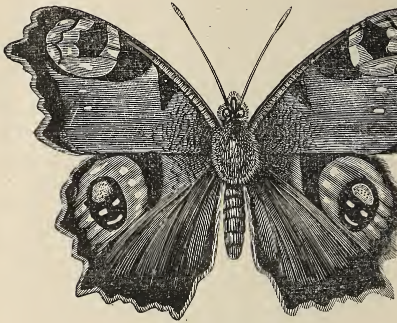
LARGE CABBAGE BUTTERFLY
(*Pieris brassicæ*).

Réaumur informs us that this butterfly attaches itself, while in the pupa state, by a skein of about fifty threads, to some secluded retreat during the larva state. In fair weather the perfect insect appears about the end of April or early in May, and may be considered as among the earliest of these beautiful heralds of springtide.

There are several smaller species of the Cabbage Butterfly; they all feed upon the cabbage, whereupon their eggs are attached in clusters, the larger end being fixed to the surface of the leaves. We have found these larvæ in great numbers on the nasturtium, of which they appear to be very fond. Great numbers of these insects are fortunately destroyed by a kind of fly known as the ICHNEUMON (*Microgaster glomeratus*), which deposits its eggs in the body of the living caterpillar before it assumes the pupa state, when these internal parasites burst through the skin of their victims in the form of a graceful Hymenopterous insect, of essential service to mankind in thus reducing the numbers of our most formidable garden enemies.


ICHNEUMON FLY
(*Microgaster glomeratus*).

The well-known PEACOCK BUTTERFLY (*Vanessa io*), belonging to the family NYMPHALIDÆ, measures from 2½in. to 3in. in the expansion of the wings. The upper wings are of a rich reddish brown, marked near the apex with a large eye, somewhat resembling that which ornaments the peacock's fan, from whence probably this brilliant insect has derived its popular name. The caterpillar, which is prickly black, spotted with white, feeds on the common stinging-nettle, and is abundant in most parts of England at Midsummer and the end of July. It is rarely seen in Scotland, as it requires a mild temperature for its development, which accounts for its late appearance in this country. It has been known, however, in peculiar instances, to hibernate during the cold season, and to reappear on sunny days during the early spring—thus,



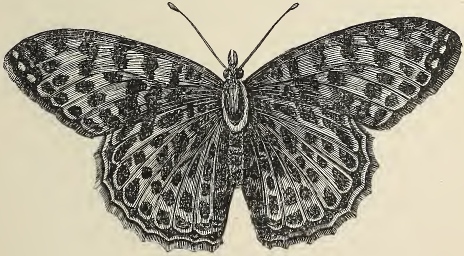
PEACOCK BUTTERFLY
(*Vanessa io*).

it may be, giving rise to an erroneous idea that it is naturally produced at that early season. We have found the Peacock Butterfly apparently in good condition in barns and outhouses in the middle of winter.

Our earliest butterfly, the Brimstone (*Gonepteryx rhamni*), like the Cabbage Butterfly, belongs to the extensive family Papilionidæ. It is not, however, as universally common as its white relative of the kitchen garden, being found more frequently in the southern and midland counties than in the north of England. In favourable seasons we have observed it as early as February and March. The caterpillar is green, with black scale-like dots on the back. It feeds on the buckthorn (*Rhamnus catharticus*) as well as the alder.

This butterfly is rarely found in Scotland, although occasionally seen in the north of England.

To the NYMPHALIDÆ, with its handsome relative the Peacock, belongs the RED ADMIRAL BUTTERFLY (*Vanessa atalanta*), which we have little hesitation in ranking among the most brilliant and attractive of our British butterflies. The expanse of its wings is equal to that of the Peacock Butterfly. The groundwork of the fore wings is a deep velvety blue-black, with an irregular central bar of bright scarlet. On the fore wings is a large white spot, surrounded with a row of smaller white marks, both pairs being margined with a bright sky-blue wave. The caterpillar is dusky-green, and feeds upon the stinging-nettle. The perfect insect, which appears late in the summer, is very abundant wherever nettles are common; it is also fond of the ivy flower and the dahlia. It will also suck the juice of fallen stone fruits, but seldom touches those which are growing.



SILVER-WASHED FRITILLARY
(*Argynnis paphia*).

To the same family, NYMPHALIDÆ, belongs a large group of very beautiful butterflies, known as FRITIL-

LARIES. The SILVER-WASHED FRITILLARY (*Argynnis paphia*), the largest British species of its kind, is plentiful in the south of England, and commonly found in woods in July. The caterpillar feeds chiefly on the dog-violet, and sometimes on the nettle and raspberry. The under side of the wings appears as if it were washed with silver on a groundwork of metallic green, the caterpillar being black, streaked with yellow lines.

In sunny breaks of the woodland we occasionally discover the PEARL-BORDERED FRITILLARY (*Argynnis euphrosyne*). The under sides of its wings resemble inlaid mother-of-pearl, varied with bead-like spots of silver. It has two broods in the year—one in the early summer, and a later produce in the autumn. The caterpillar, which is black and white, feeds on the dog-violet.

To the NYMPHALIDÆ also (although distinct from the Fritillaries) belongs a handsome butterfly (somewhat less brilliant, however, than those just described), known as the large TORTOISESHELL BUTTERFLY (*Vanessa polychloros*); it measures nearly 3in. across the wings. On the upper side the wings are orange-coloured, spotted with black, with a festooned margin of black and blue. The caterpillar feeds on the elm.

To the third family, LYCINIDÆ, belong those pretty delicate little blue butterflies (some measuring less than an inch in the expanse of their wings) which abound in our meadows from April to July, especially in Kent, Middlesex, and Hertford. So common, indeed, are many species of these small blue butterflies, that they extend nearly all over Europe. One of them, the

Bedford blue butterfly (*Polyommatus alsus*) is our smallest British butterfly, measuring from five-sixths to one inch across the wings. The top wings are brownish above, with a blue metallic tinge towards the base, whilst the under part of each wing is a light ash colour, marked with black.

BEDFORD BUTTERFLY
(*Polyommatus alsus*).

To the same family, forming a beautiful contrast with their little blue companions, belong the Copper Butterflies. The common COPPER BUTTERFLY (*Chrisophanus phlœas*) is one of our most brilliant species. It is seen often in company with the blue butterflies, appearing, however, rather earlier and remaining with us a month later than the latter species. Although so widely distributed as to be little prized by collectors, this insect does not fall short, as to beauty, of any other occupant of our cabinets. The fore wings above are of a fiery copper colour spotted with black, varied on the under wings by bright blue dots.

COMMON COPPER BUTTERFLY
(*Chrisophanus phlœas*).

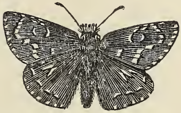
As a type of the sombre family, HIPPARCHIDÆ, we picture the common RINGLET BUTTERFLY (*Hipparchia hyperanthus*). It is one of the least showy of our diurnal lepidoptera. When closely examined, however, eye-like figures, known as ocelli, greatly relieve the dull brown ground of this insect's wings, both on the upper and under surface. These eyes vary considerably in some individuals of the same species, being so closely placed together as to appear united like a ringlet, whilst in others they are distinctly separate. These insects may be seen in almost every part of the country in June.

RINGLET BUTTERFLY
(*Hipparchia hyperanthus*).

The caterpillar feeds on grass, the roots of which it attacks by day, leaving the blades for an evening repast.

The WALL BUTTERFLY (*Lasiomata megera*), of the same family, although partaking of its relative's quiet style of dress, is not quite so sombre-toned as many of its family—the ground colour of its wings being of a dull yellow, crossed with brown bars. Only one largish ocellus ornaments its fore wings, whilst the under wings are marked with four smaller eyes. The larva, like that of the Ringlet species, feeds on grass. The perfect insects, however, appear somewhat later than the Ringlet butterfly does. It is very difficult of capture, flying from its sunny station on walls at the most distant approach of the collector.

The butterflies which belong to the family HESPERIDÆ seem to be a link between the nocturnal and diurnal Lepidoptera. Boisduval has given them the name of *Involuti,* from their habit of curling up leaves for their pupæ more after the manner of moths than that of their day-flying brethren. Among them is a group of very pretty little insects, measuring about 1in. across the wings. These are popularly known as *Skippers*—thus named from the jerking movements of their flight. The GRIZZLED SKIPPER (*Pyrgus malvæ*) is most commonly found in our eastern counties, but is not uncommon in other parts of England and the south of Scotland. There are seven species of Skippers, but none so common as that which we have taken as the type of its family. The seven species of Skippers are thus named: 1. GRIZZLED SKIPPER (*Pyrgus malvæ;* 2. DINGY S. (*Nisonlades tages*); 3. CHEQUERED S. (*Cyclopides paniscus*); 4. LARGE S. (*Pamphilia sylvanus*); 5. PEARL S. (*P. comma*); 6. LULWORTH S. (*P. Actæon*); 7. SMALL S. (*P. linea*).


GRIZZLED SKIPPER
(*Pyrgus malvæ*).

With this group we close our short history of the most common British butterflies.

To supply the many omissions we have had to make, in order to keep our little book within the limits we propose it should occupy, we refer the reader who is interested in this subject to Westwood's "Butterflies of Great Britain," to which beautiful work we are indebted for some of the information we have given about our butterflies.

ORDER VII.

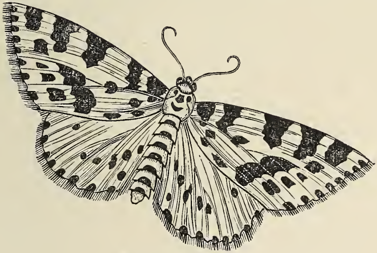
LEPIDOPTERA (*Scale-Winged*).

(*Continued.*)

THE HETEROCERA, or Moths, are so similar to butterflies that the general observer often finds some difficulty in distinguishing them. The moths, however, present a greater variety of structure than the butterflies, from which they may be easily distinguished by the antennæ, which in the former are generally either plumose or tapered off towards the end, whilst in butterflies these organs are clubbed at the extremity; and the wings of butterflies are held in an erect position while at rest, those of the moths being flattened downwards. Of the butterflies we have only sixty-six species, whilst those of the moths fall little short of 2000, to which great numbers of new species are frequently added. Although moths are, for the most part, night-flyers, this is not universally the case, as some species come abroad during the day, and, like butterflies, feed on the juices of plants.

From among the numerous families into which the moths have been divided we select five, as containing the most common species: 1. GEOMETRIDÆ (*Gooseberry Moths*); 2. BOMBYCIDÆ (*Silkworms Tiger Moths*); 3. SPHINGIDÆ (*Hawk Moths*); 4. NOCTUIDÆ (*yellow under wings—Silver Y Moth*); 5. TINEIDÆ (*Clothes Moths*).

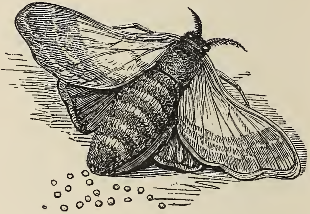
The MAGPIE MOTH (*Abraxas grossulariata*), which belongs to the first, is very common in the neighbourhood of London, and does much mischief, in common with most of its family, to the gooseberry bushes. These moths may be found preying on the young buds, and should be sought and destroyed early in the morning before the dew is off, as at that time they generally collect for their destructive breakfast. In



MAGPIE MOTH
(*Abraxas grossulariata*).

their perfect state, about the end of July, they are dull and slow in their flight, wandering into dark outhouses and sheds, when they become an easy prey to spiders, which, with small birds, assist in keeping them in due subordination.

To the BOMBYCIDÆ belongs the SILKWORM; and although this moth cannot be reckoned among British insects, we have been so long familiarised with it, that we feel disposed (however incorrectly) to treat it as our own. There is great probability, however, that in the course of time some species may become naturalised to this country; and one in particular, *Bombyx cynthia* (the Ailanthus Silkworm), we may reasonably hope to cultivate successfully. More than a million of the trees upon which it feeds (*Ailanthus glandulosa*) were successfully planted in France in 1861. As this is a hardy species, requiring little cultivation and thriving in a temperate climate, we may look forward with much interest to the probable introduction of this valuable moth into our own country. The species with which



SILKWORM MOTH
(*Bombyx mori*).

we are most familiar (*Bombyx mori*) was introduced into Europe about the sixth century by some Greek missionaries, who, it is said, brought some of the eggs to Constantinople concealed in their staves. It feeds almost entirely on the mulberry leaf. In the perfect state it is a cream-coloured sluggish moth. The eggs when good are of a pale grey, and when imperfect of a yellow hue. In the larva state it changes its skin four times, at intervals dependent upon the degrees of heat to which it is exposed. If the worms be subjected to a temperature of 80° to 100° Fahrenheit, more than five days will not be required between the third and fourth moultings; whereas, if the temperature be lower, the process will occupy a longer period. Silkworms in this climate go through all their changes in about sixty days—in this period moulting or shedding their skins three or four times. Before each successive moulting they become dull and cease eating, but after casting their skins regain their appetite. On the tenth day they cease eating, and begin work. The silk is secreted in two long slender vessels in the insect's intestines, and each thread is found to consist of two cylinders. The cocoon incloses the chrysalis, which is spun in about five days, and is surrounded by three distinct layers of silk—the first loose, flossy, and unfit for manufacture, the second closer, and the third (of which we make use) fine and close in its texture. In about a fortnight after the cocoon is complete the moth bursts through its prison walls. In order to open the cocoon, it moistens this case with a liquid secreted from the stomach, which softens the wall, and opens an aperture whereby the moth easily makes its exit. The female then lays her eggs, takes no food, and dies, with her mate, after a period of about twenty days.

Our beautiful CREAM-SPOTTED TIGER MOTH (*Arctia vilica*) belongs also to the BOMBYCIDÆ. Its larva is well known to country children as the "hairy bear," expressive of the thick and long fur-like bristles wherewith it is covered. It feeds on grass, and buries itself before its first change. The upper wings are of a rich brown, with large cream-coloured markings ; the under pair are bright yellow, spotted with black. Added to these pretty features, the black body, with a bright red tail, renders this moth a very gay and beautiful creature.

CREAM-SPOTTED TIGER MOTH
(*Arctia vilica*).

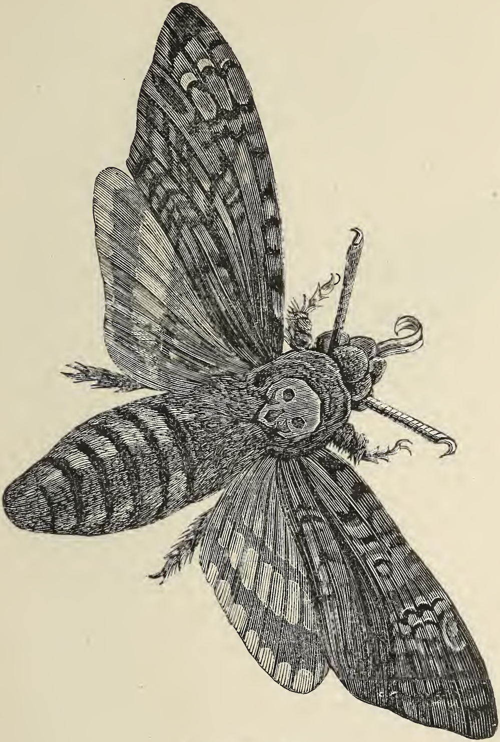
The GREAT TIGER MOTH (*Arctia caja*) has a general resemblance to its near relative the cream-spotted tiger ; they have much the same habits. *Arctia caja*, however, is larger, and even more abundant than *vilica*.

In the family NOCTUIDÆ we have a great number of these common brown moths, which crowd the air towards the end of summer, remaining with us until October, and even as late in the year as November. Among them is the SILVER Y MOTH (*Plusia gamma*), thus named from the resemblance which a figure on its fore wings bears to the Greek gamma—also like our letter "y"—traced in silver. This moth is generally abundant near the wild strawberry.

SILVER Y MOTH
(*Plusia gamma*).

In the family TINEIDÆ we recognise our familiar little enemy the CLOTHES MOTH (*Tinea vestianella*). It is not, as is commonly supposed, simply for the sake of gratifying its appetite that this insect attacks our furs and woollen goods. Its chief object in doing this is to clothe itself during the pupa state, for which purpose the materials it attacks are curiously *felted together* to form a covering for the naked worms, which have scarcely breathed before they begin thus to provide themselves a wardrobe. The suit, however, which fits them from infancy to mature age, requires occasional enlargement, which is accomplished with wonderful skill and neatness by this insect tailor. The shape of this dress is a cylindrical case, open at both ends, and admirably suited to the form of the wearer. Mr. Spence says: "The stuff of which these coats are composed is an incorporation of wool or hair artfully cut from our clothes or furniture, united with silk drawn from the insect's mouth to form a warm and thick tissue, which, not being sufficiently delicate for the creature's tender skin, is lined with a layer of pure silk, always of the same colour as the object wherefrom the material is pillaged. The Clothes Moth has a great dislike to strong light, and rarely deposits its eggs in objects exposed to the full influence of the sun. When once the eggs are laid, their incubation is not to be prevented by pepper, spices, or camphor. Full exposure of our goods to daylight, and protection from damp, are our best safeguards against the destructive Clothes Moth."

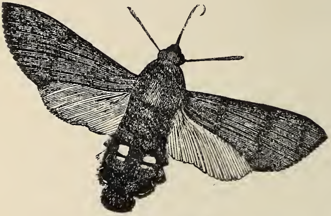
The largest British moth, the DEATH'S HEAD (*Acherontia atropos*) belongs to the family SPHINGIDÆ. It measures from 4in. to 5in. in the expanse of the fore wings, and is marked on the back of the thorax (chest) with a strange figure resembling a skull. Latreille informs us that at one period, during the prevalence of an epidemic malady in Brittany, the inhabitants blamed this poor harmless creature as the cause of their affliction; and it is to be feared that among the more ignorant of our own countrymen the same superstitious terror concerning this insect is very prevalent—augmented, no doubt, by a strange squeaking sound which it emits, caused, as Réaumur considers, by the friction of its spiral tongue against the jaws. There is, however, much diversity of opinion among naturalists as to the true cause of this curious sound. The Death's Head Moth is a great enemy to bees, whose nests it will attack and pillage with great boldness. Hüber, however, tells us that these accomplished little soldiers generally



DEATH'S-HEAD MOTH
(*Acherontia atropos*).

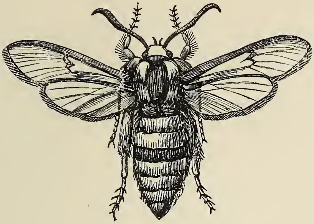
succeed in excluding their formidable enemy by barricades of wax and other materials, raised at the entrance of their habitations. The caterpillar also of this moth when touched will draw back with a sharp explosive sound In the perfect state it appears towards the close of autumn. The caterpillar is very large, with a kind of horn at the extremity of the body; it feeds voraciously on potato leaves.

A beautiful species of the same family, the HUMMING-BIRD MOTH (*Macroglossa stellatarum*), is not uncommon within a few miles of the metropolis. During flight, it makes, through the rapid movement of its wings, a musical humming sound, somewhat resembling that which we understand the humming-bird produces by the same means. It is entirely diurnal in its habits, and during flight is poised in the air above the flowers wherefrom it sucks its sweet repast. The caterpillar is pale green, striped with white; and projecting from the tail is an orange-tipped horn. It feeds largely on some of the common burr-bearing weeds of our hedgerows.



HUMMING-BIRD MOTH (*Macroglossa stellatarum*).

Some of the SPHINGIDÆ differ so much from the majority of hawk moths, that to the novice in entomology they might rather be taken for hymenopterous than for lepidopterous insects—some resembling bees and hornets, whilst others are like gnats and ants. To these clear-winged species names are given according to the insect they resemble : thus, *Sesia apiformis* is like a bee ; *Vespiformis,* a wasp ; *Tipuliformis,* a gnat ; *Formiciformis,* an ant ; and so on through several other species.



BEE HAWK MOTH
(*Sesia apiformis*).

ORDER VIII.

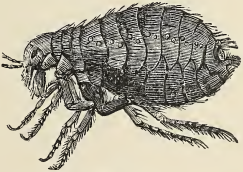
APTERA (*Wingless*).

THE only true Apterous insects common in this country belong to Latreille's sub-class Ametabolia, containing those insects which undergo no regular metamorphosis. To this sub-class belong the two orders, or rather sub-orders, Aphaniptera and Anoplura, wherein Latreille and Leach place the fleas and lice. To the first of these orders belongs the single family *Pulicidæ,* represented happily for us by only one familiar species, the Common Flea (*Pulex irritans*); and, although there are many kinds of fleas which infest various animals, suffice it for the present to notice that species wherewith we are more personally concerned, and which, unfortunately, does not allow its existence to be ignored even by the most fastidious among us.

As indicated by the name of the order it occupies, Aphaniptera (*obscure winged*), we see the flea is not entirely destitute of the organs of flight, which, however, are so obscure and rudimentary in this insect as to be almost imperceptible to the naked eye. The flea is entirely an animal feeder. It is said to have a special dislike to wormwood, a fact which has suggested a quaint old rhyme by Tusser, quoted by Kirby and Spence, from whom we borrow it, as the best recipe for banishing these household pests:

> When wormwood hath seed, get a handful or twain
> To save against March to make flea to refrain:
> When a chamber is sweeped and wormwood is strown,
> No flea for its life dare appear or be known.

Few persons, we imagine, will sympathise with a lively old lady who liked fleas on account of their vivacity of character, never having seen a dull flea in all her life. We remember, however, an exhibition of fleas in London which attracted great numbers of spectators, and truly it was interesting and curious to see these minute creatures trained to strange feats which seemed to indicate an almost incredible degree of sagacity and tractability.


COMMON FLEA
(*Pulex irritans*).

Fleas undergo no regular transformations, and generally lay their eggs among the hair of the animals they infest. They will also breed in woollen stuffs, wherein, after a few days, the eggs are hatched, producing small white grubs, which in favourable weather arrive at maturity in about five or six days. It is calculated that no less than twelve species of the Pulicidæ (*fleas*) infest our domestic animals, including the dog, poultry, pigeons, and others. It is probable that these insects do not readily quit the animals upon which they are parasitic to attack human beings. They will, nevertheless, occasionally pass from one to the other; this, however, being a rare occurrence, generally dependent upon accidental circumstances, as when poultry, disturbed whilst roosting, shake their fleas down upon any person or object beneath them; much temporary annoyance doubtless often being suffered in this way, but the insects seldom remain long in their new quarters.

Fleas are very tenacious of life, having been known to survive after twenty-four hours' immersion in cold water. Thus we see the error of sending dogs into a cold bath to get rid of their fleas, when, indeed, warm water and soap would be a much more effectual remedy, as fleas, in common with most other insects, cannot survive a temperature of 120° Fahrenheit—a degree of heat not too great either for the comfort or health of our canine friend.

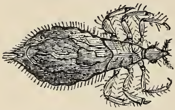
Disgusting and offensive as are the insects belonging to the sub-class Anoplura, including the Louse and its allies, these little creatures have excited perhaps more controversy as to their exact position in the animal kingdom than most of the more attractive of its members have done. And, indeed, notwithstanding the disgusting associations with dirt and moral degradation attached to these insects, the entomologist has found many interesting points of inquiry and speculation connected with them.

The Nirmidæ (*Bird Lice*) are distinguished from those which infest the mammalia by being *mandibulated* (furnished with jaws), whilst the species parasitic upon the mammalia have a rostrulated (*tubular*) mouth. In the family Pediculi the commonest species is that which infests the human being (*Pediculus cervicalus*), and gums its *nits* (eggs) to the hair, in preference to any other situation. We have found the nits of this species rendered entirely barren by the application of hellebore powder.

Leeuwenhoek, who made these disagreeable insects a subject of special study, kept a pair of common lice in a stocking, which he wore night and day; he found in eight weeks that they might produce 5000 descendants. The same naturalist asserts that the louse does not commence laying until it is a month old, and that the eggs are not hatched until the eighth day after being laid.

Apt as we are in refined society to ignore the existence of this pest of the *canaille,* we are informed that a disease formerly known as *Phthiriasis,* caused by lice, was highly aristocratic, attacking chiefly kings, princes, and the great ones of our race.

The egg of a common species (*Pediculus humanus*) is curiously constructed with a hinged lid to admit of the easy exit of the young insect, which seems to be weaker than most insects are in their earlier stages of existence. For even the most noxious insects we have endeavoured to find some redeeming quality, in the full belief that the Author of all Good has created no being merely as a pest and annoyance to others. Little, however, as we have to say in favour of lice, may they not serve a good purpose in making us more watchful and careful as to the cleanliness of our persons and homes, in order to avoid their unwelcome visits? The louse undergoes no regular metamorphosis.


HUMAN LOUSE
(*Pediculus humanus*).

SPIDERS.

WANTING the three distinctive sections which characterise the true insect, Spiders have been placed with the scorpions in the class ARACHNIDÆ. They come under a separate order (*Pulmonaria*),* and belong to the family *Araneidæ*, whereof there are many species. The head and thorax are united in these beings so as to form a *cephalo-thorax*, which is joined to the abdomen by a short foot-stalk. The eyes are simple, and generally eight in number. Again, the spider differs from insects in not undergoing any regular transformations; it is, moreover, entirely destitute of wings, whereof the true insect is always possessed in a rudimentary state, if not fully developed. In common, however, with some insects, the spider undergoes several successive moultings before arriving at maturity. Two jointed pinchers take the place of the antennæ, and are used to seize and pierce the spider's prey, which consists of flies, moths, aphides, and, indeed, any insects which may be entangled in the web. The spider's power of vision is so acute, and its movements so rapid, that its victims have little chance of escape when once entrapped ; it also instils into the wound inflicted a poisonous fluid, which causes the immediate death of its prey.

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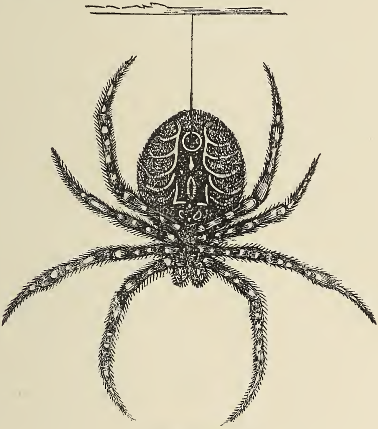
* Breathing by lung-like sacs.

The House Spider or Weaver (*Aranea domestica*) has a curious way of hiding in a secret corner of its lair, and darting with extraordinary rapidity and cunning upon its victim, allowing not the remotest chance of escape to the unfortunate prisoner.

The Garden or Geometrical Spider (*Epeira diadema*) constructs her web very differently to the House Spider, that of the former species being composed of two kinds of silk ; the cords forming the circles are covered with a viscid substance, whilst those of the radii are not adhesive. This peculiarity of the Garden-Spider's web was first observed by Mr. Spence, who says the fact may easily be proved by casting on the web some light powder, which will adhere to the circles, leaving the radii uncovered. The Garden Spider repairs her web every twenty-four hours, whilst our housemaid's enemy will suffer hers to be injured without any attempt to mend it—preferring, it seems, to construct a new web to the greater trouble of repairing the old one. The material whereof the web is formed is secreted within the spider's abdomen, and exuded therefrom through three or four teat-like projections, known as spinnerets. Many separate strands are required to form a single cord of the web; and Leeuwenhoek informs us that from a spider the size of a grain of sand four millions of threads are spun to form a cord the size of a single human hair. After springing or dropping from place to place of the object whereon she founds her web, the spider arranges the separate threads with her hind-legs—thus constructing, with geometrical accuracy, an edifice not to be rivalled by the most skilful human mathematician. These interesting creatures may be easily tamed; indeed, we have known one so completely familiarised as to come forth fearlessly from its hiding-place into the



GARDEN SPIDER
(*Epeira diadema*).

centre of the web at our frequent approach with a fly for its daily meal. The case wherein the spider incloses her eggs is a kind of sack or cocoon composed of a glossy silk-like material. In an interesting species of spider, the Water Skimmer (*Lycosa saccata*), this bag is carried by the mother wherever she may roam; and the young, when hatched, will collect by hundreds on her back—never quitting the maternal protection until of sufficient age and size to provide for themselves. We have seen one of these spiders, which fell by accident into a water trap laid in a hot-bed for woodlice, covered with her innumerable brood, secure in this insulated position from all greater mischances, whilst in no danger of drowning, from the curious power possessed by this species of skimming the water's surface. The *Lycosa saccata,* however, is generally terrestrial in its habits, and must not be mistaken for the Water Spider or Diver (*Araneida natantes*), which fastens her nest (in form like a diving-bell) upon those water plants which grow at a considerable depth beneath the surface. The Diving Spider is an interesting occupant of the aquarium, where it may be seen passing and repassing with its prey, which it devours deliberately in this cage-like residence. The hairs covering its body entangle so much air that this spider is obliged to descend, as by a natural ladder, composed of aquatic plants, to which it clings when requiring to remain under the surface—its natural buoyancy enabling it to rise at will. It carries a supply of air to its nest, which, thus supplied, appears like a beautiful silver bell beneath the water. This species are very voracious and cunning in their mode of capturing their prey. Kirby and Spence say: "This race exemplify in miniature almost all the modes of obtaining food which prevail amongst predacious quadrupeds—the audacious attack of the lion, the wily spring of the tiger, the sedentary cunning of the lynx, and the amphibious dexterity of the otter."

The Harvest Man (*Phalangium cornutum*) is well known to persons who frequent the hay fields towards the end of summer. This spider has a very small body and eight legs about 1½in. in length, which project when at rest quite ½in. above the spider's little oval body. Like the legs of the crane fly, those of the Harvest-Man Spider retain their irritability for some seconds after being separated from the body. These spiders run with great rapidity among the long grass, and are caught with difficulty, except when at rest, as they are often found upon walls and palings, where they stand basking in the sun—their long legs covering a space of 2in. or 3in. in diameter. They are also sometimes discovered among stones, but generally prefer to roam wildly among the long grass, where they are well supplied with the small insects which form their food.

The method whereby the Gossamer Spider (*Aranea obtextrix*) performs its fairy rope-dances through the air has been a subject of much difference of opinion among naturalists. The most probable theory, however, seems to be that the little creature fastens the foundation of her string upon some high object, such as the bough of a tree, and, partly descending, has the power of swinging herself laterally, and, indeed, in all directions—a process materially aided, though not entirely effected, by currents of wind. British spiders vary from the size of a grain of sand to that of a hazel-nut ; and those of tropical countries attain the formidable dimensions of a small mouse.

MITES.

THE class *Acaridæ* contains the mites. There are several distinct families of mites, wherein we shall find many familiar species. To the true mites (Acari) belongs the Cheese Mite (*Acarus casei*), of such minute size that, when collected together in large numbers, they have the appearance of masses of animated dust. These, however, must not be confounded with the Cheese-hopper (*Piophila casei*), which is the larva of a Dipterous insect only found in new moist cheese, whilst the mite inhabits that which is old and dry. To the family Ixodiadæ, which is nearly allied to the true mites, belongs the Dog Tick (*Hæmatopinus piliferus*), too familiar to our canine friends, in whose skin these annoying creatures half bury themselves, having the appearance of warts or tumours on the surface of the dog's body, and so firmly will these creatures retain their hold of the victim that the tick's heads may be torn from their bodies before they will loosen their hold of the unfortunate animal, with whose blood the ticks are often distended to the size of a large pea, their natural size being so small that they are with difficulty discovered in the brushwood and briars they frequent.

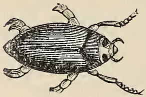
The Domestic Mite (*A. domesticus*) is a great pest among our collections of insects, stuffed birds, &c., no means, even the use of camphor, having as yet been discovered whereby these intruders may be effectually banished. From the rhinoceros and elephant to the minute insect, most members of the animal kingdom are invested with the mite parasite, the human frame not being exempt from its presence. One of the human Mites (*A. folliculorum*) is often found under the skin (especially of the nose), having the appearance of little black dots not larger than a grain of dust in the centre of small pimples, wherefrom they may be carefully squeezed, without pain or inconvenience to the person thus affected. These mites, when young, are like very small white worms. Their presence, we believe, is no indication of serious disease. A less harmless human parasite of the same family is *A. scabiei,* which is found in the vesicles of the itch. The Harvest Bug (*Leptura autumnalis*) is supposed by some naturalists to be the young of a kind of tick. It is very abundant during the grass harvest, and, getting into the human feet and ankles, causes great irritation, being withdrawn with difficulty on account of its very minute size (not larger than a grain of sand). The naked eye sees it with difficulty. It is injurious to vegetation, and may be detected in great numbers by its dusty red hue on many vegetables, especially the French bean, which suffers much by its presence.

We are informed that *ninety millions* of the eggs of the cheese mite would not more than fill the shell of a pigeon's egg, and there are many species much smaller than the *Acarus casei.* Owing to their minute size, the Water Mites (*Hydrachnidæ*) are unfamiliar to the general observer. Their presence, however, may often be detected by an appearance in the water of floating cloud-like masses of a dull red colour, which consist of myriads of these little beings. They deposit their eggs, like the ichneumon fly, in the bodies of living insects, the Water Scorpion (*Nepa cinerea*) being generally selected for the reception and nutrition of the young water mites. The Red Satin Mite (*Trombidium holoserica*) much resembles a small spider, for which it might easily be mistaken. It is common on palings and in dry situations in our gardens, and, like the spider, has the power of spinning a web for the protection of its young. The growth of many plants is much impeded by entanglement in this exquisitely fine but far-spreading network. The young of this species are generally parasitic upon insects. It may be well here to observe, in order to warn the uninitiated against error, that the young of some small spiders and the larger mites are somewhat alike externally; the chief difference between these two orders consists in the breathing apparatus. The formation of the mouth also differs in each. The spiders are possessed of eight eyes, whilst the mites are totally destitute of the organ of sight—distinctions which a moderate magnifying power will suffice to render very apparent.

WATER INSECTS.

SINCE the introduction of the aqua-vivarium we have become familiarised with the hitherto almost hidden life of water insects whose habits, indeed, are no less worthy of careful study than those of the terrestrial species. The order Coleoptera is represented by a vast number of water beetles, and, including the aquatic larvæ of several terrestrial insects, we find that every order, with the exception of the Hymenoptera, Orthoptera, and Lepidoptera, has its representative among the inhabitants of the pond and river.

To commence with the beetle tribe, Coleoptera. Few persons, we imagine, can have failed to notice during their country rambles the more common water beetles, from the little gem-like Whirlwig (*Gyrinus natator*) to the great Diving Beetle (*Dyticus marginalis*). The former merry little insects may be seen in early spring, sporting on the surface of every country pool, wherein they generally select some sheltered bay, assembling in companies of ten or twelve, sporting incessantly in graceful circles, and darting beneath the surface at the slightest alarm. They are easily frightened, on account of their wonderful acuteness of sight caused by the possession of two pairs of eyes, one above for seeing in air, and a second pair beneath, for perceiving under water. This beetle's extreme rapidity of pace compensates for its minute size and proportionate weakness, so that few enemies have a chance of capturing it by superior or even equal swiftness of movement. The Diving Beetle (*Dyticus marginalis*), a large common water beetle, of a rusty-black hue, with flattened edges to the wing-covers, is very common in every pool and pond. It is generally found in shallow water, hiding amongst weeds and grass growing on the bank. It measures about 1in. in length, and ½in. across the widest part of the wing-covers. Both in the larva and perfect states, it seems to establish by might its right to entire sovereignty in the pond it inhabits, other beetles, aquatic larvæ, water snails, and fish, alike falling victims to this insect despot's insatiable voracity. Fortunately, however, for its aquatic companions, its movements are not very rapid while in the perfect state. It may be easily caught with


WHIRLWIG
(*Gyrinus natator*).

a string and a bit of raw meat, to which the beetle clings by means of two very curious suckers on the first joint of the fore-legs, preferring thus to be drawn out of the water to relaxing, for a moment, its firm grasp of the bait. By occasionally supplying a morsel of raw meat to this insect, it may be kept for months in a bottle, and it is amusing to see with what rapidity and evident relish it devours its meal immediately upon being supplied with it. These, and all water insects, are very sensitive to changes of temperature, and die quickly when exposed in confinement to the direct rays of the sun. No insect, not even the young of its own species, can be kept in confinement with the *Dyticus marginalis* without becoming its prey. In the larva state these insects are, if possible, more voracious than they are later in life. The larva's movements, which are effected by jerks of its fish-like tail, are much more rapid than those of the perfect insect, the beetle rowing itself deliberately by strokes of its hind-legs, which are fringed at the edges, and admirably adapted to this purpose. A larger beetle than the *Dyticus,* though not as common in our ponds, is the great Hydrous (*Hydrous piceus*), belonging to the family *Hydrophilidæ.* It measures 1½in. in length, and is proportionately wide, thus exceeding in size all other British beetles. Unlike the *Dyticus,* this beetle is a good mother, securing her eggs, which are inclosed in a silken case, to the stems and fronds of those weeds which grow above the surface of the water. Being chiefly a vegetable feeder, this *Hydrophilus* lives on peaceful terms with its companions of the pond. Notwithstanding, however, its superior size, it sometimes falls a victim to the *Dyticus*, which, attacking it in a vulnerable part, between the thorax and abdomen, quickly kills and devours it. It is an interesting and harmless occupant of the aquarium, occasionally, but very rarely, indulging in a water snail by way of a *bonne-bouche*.

The order HEMIPTERA contains the true water bugs, whereof there are only two families—the Boat Flies (*Notanectidæ*), and the Water Scorpions (*Nepidæ*). The boat flies are thus called from a peculiar habit of swimming on their backs and rowing themselves, thus having the appearance of miniature boats upon the surface of the water. The hind-legs, which are fringed laterally with strong hairs, somewhat resemble the oars of a boat. These insects are very abundant in still water, and feed entirely upon insects and aquatic larvæ, especially those of the May Fly (*Ephemera vulgata*). In the larva state they differ from the perfect insect only in the absence of wings, which are so fully developed in the perfect insect as to enable it occasionally to take short flights from the water; the insect, however, seldom takes advantage of this power. Its eggs are deposited on water plants and hatched in the spring, producing active and voracious larvæ. The Boat Fly (*Notanecta*) is able to inflict a sharp and painful bite, which, from the throbbing sensation produced, might be mistaken for the wound of a sting. We have suffered severely from over boldness in handling this fierce little creature. It is a lively occupant of the aquarium, but a dangerous companion of smaller insects. The Water Scorpions (*Nepidæ*) somewhat resemble the boat flies. In our commonest species, however (*Nepa cinerea*), the fore-legs differ from those of most water insects, being shaped like the scorpion's claws—a circumstance which has doubtless given rise to the popular name whereby this insect is known. The *Nepa* is a pretty and graceful insect, about two-thirds of an inch long, of an ashy grey above, and red beneath the abdomen. The lower extremity of the body is furnished with two long bristles, *setæ*, which, when expanded, give the insect a very graceful appearance. It captures its prey by means of its powerful fore-legs, which are hooked at the extremity, and calculated to retain a very firm hold of the victim, which on account of the *Nepa's* slow movements is caught with more difficulty by this species than by the generality of water insects. To the *Hydrometridæ* (true water bugs) belongs the Water Measurer (*Hydrometor stagnatum*), an opaque black Hemipterous insect, with long slender legs. It is seen on still water, being, we believe, frequently mistaken for a water spider. Unlike most water insects, the *Hydrometor* does not dive, but is raised by the flattened shape of the first joint of its legs a little above the surface of the water, whereupon it moves by short quick jerks, darting along with a rapidity the eye can scarcely follow. It is needless now to repeat the account we have already given of the aquatic larvæ under the different orders to which they respectively belong ; suffice it to remind our readers that the gnats among the Diptera, and Dragon flies, May flies, and Caddice flies, among the NEUROPTERA, are inhabitants of the water during the larva state. The breathing orifices (*spiracles*) of most water insects are situated at the lower extremity of the body, instead of being placed along the sides, like those of the terrestrial species. Thus we see the water beetles frequently rising to the water's surface, with their heads downwards, for the purpose of respiration, the air thus taken in being conveyed directly through widely ramifying air tubes (*tracheæ*) to all parts of the insect's body.

CENTIPEDES AND WOODLICE.

ALTHOUGH naturalists have placed the CENTIPEDES in a distinct class (ANNELIDA), these animals are so closely allied to insects as to have been formerly comprehended in the class INSECTA. The difference, however, between the members of these two classes is sufficiently obvious to prevent any confusion as to their respective positions. In the first place, the Centipedes are entirely destitute of wings, even in the most elementary form, nor have they any line of division between the thorax, and abdomen, and a still more important distinction is the fact that they undergo no regular metamorphoses like those of the true insect. In common with the insect, however, the young centipede undergoes several successive moultings, and although entirely without legs when first hatched, it gains an additional pair of these members at each renewal of its outer skin, the number of legs amounting finally to as many as from twenty to twenty-five pairs. Centipedes are frequently found in the heart of ripe fruits, and, for this reason, they are supposed by the general observer to be vegetable feeders. Dr. Carpenter, however, says: "Of their carnivorous propensities the structure of the mouth affords sufficient evidence;" and it is probable that this creature's frequent visits to our garden dainties are rather made with the object of preying upon the insects which may have originally attacked the fruit than with that of actually devouring it. The Electric Centipede (*Scolopendra electrica*) is not uncommon in this country. Its path is marked with a phosphorescent track, and it leaves its light on the fingers of persons who handle it. Another common species of this order is the Pill Centipede (*Glomeris marginatus*), which so greatly resembles the Armadillo Woodlouse (*Oniscus armadillo*) that one might easily be mistaken for the other. Like the woodlouse, this centipede has the power of rolling itself into a little ball, probably for the purpose of escaping birds and other enemies, which are not generally tempted by such inert and lifeless forms as those assumed by this centipede and many insects whose only defence against certain enemies consists in similar cunning contrivances. To the entomologist, however, there is an unmistakeable difference between the armadillo woodlouse and the pill centipede. In the pill centipede the limbs are short, and do not appear laterally beyond the jointed carapace or back-plate. In the woodlouse the antennæ are longer and more filiform or pointed than those of the centipede, whose shelly covering is harder than the woodlouse's armour. To the inhabitants of tropical countries the centipede is often a formidable enemy on account of its venomous bite, which is much dreaded by mankind. In Europe, however, it is entirely innocuous, and does very little injury to our vegetable produce. But we must be careful not to confound it with the destructive wire-worm, which it resembles externally, as well as in the power it possesses in common with that insect of emitting a phosphorescent light. Although quite harmless to mankind, the centipede is supposed, like the spider, to instil into its insect victims a poisonous fluid producing very fatal effects. The European centipede seldom exceeds 3in. in length, whilst in tropical climates —Carthagena for instance (Kirby and Spence)—a common species of the same animal measures a yard in length and 5in. in breadth—a hideous creature, frequently visiting the domestic circle, and hiding itself under pillows and among our clothes.

We have introduced the woodlouse and centipede together simply with the intention of pointing out the difference between them; it must, however, be clearly understood that no real relationship exists between them, Latreille and Linnæus having included the woodlice in the class CRUSTACEA, wherein crabs, lobsters, and shrimps are also placed. The centipede, however, belongs to the ANNELIDES, or ringed animals (Cuvier), wherein we find many separate genera, both aquatic and terrestrial. Our commonest species of Woodlouse (*Oniscus murarius*) is frequently found under stones and decayed blocks of wood, in the powder whereof it deposits its eggs. It seldom ventures forth by day when undisturbed, but wanders out in search of food as soon as darkness sets in. It becomes very inanimate when alarmed, and folds itself partially—not, however, rolling into such a complete ball as the armadillo species always becomes when touched. An amusing anecdote has been related of Réaumur's servant girl, who found a great number of these curious beings rolled up in her master's garden, where the entomologist had probably alarmed them in the course of his scientific investigations. The young woman mistaking the animals at first for beads, which she imagined might have been dropped there by accident, strung the poor creatures into a necklace, and expressed no slight horror and surprise when her much-prized ornament became suddenly animated. The woodlouse carries its eggs in a pouch situated over the chest. It feeds chiefly on decayed vegetable substances.

INSECT ARCHITECTS.

IN the Hymenopterous order of insects, including the bees and ants, the family *Apidæ* (bees) is pre-eminent for architectural skill. The work of the hive bee (*Apis mellifica*) is alike remarkable for the artistic skill displayed therein, and its beautiful adaptation to the purpose of storing honey and protecting the young bees when in the larva state. The business of constructing the comb is done by the neuters, which commence by attaching a semicircular block of wax to the top of the hive. This block measures about half an inch in length, one-sixth of an inch in height, and only the twenty-fourth of an inch in thickness. As soon as this foundation is laid, a division of bee artisans, known as sculptors, begin partially to excavate a circular cell on one side of the block, adding to the edges the wax removed during their work; presently two other workers commence similar operations on the opposite side of the block, taking care that the line between these two back cells shall exactly correspond with the centre of the original front excavation. The cells, however, are not allowed by these cunning and economical artisans to remain in the circular form, which would involve waste of room and material, with (Dr. Bevan informs us) imperfect ventilation; and for this reason the superfluous wax intervening between the semicircular cells is gradually cut away, leaving the hexagonal figure familiar to us in the cells of honeycomb. The sides are now angular; every wall is the wall of two cells, every roof a floor, and every floor a roof, so the work is continued downwards and towards the floor, and block added to block laterally, until the comb has attained its full dimensions.

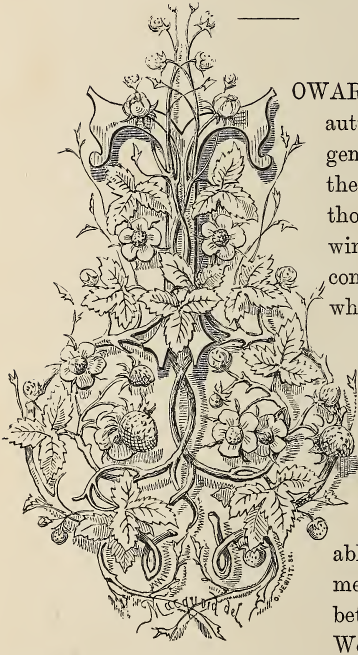
In a more detailed account of this interesting process and triumph of insect intelligence, we refer the reader to the animal economy portion of "Knight's Farmers' Library," which contains a clear and exact account of bee architecture, as well as admirable directions for the management of the apiary. From our domestic bee we pass to its wild relations, the wasp and hornet, which construct their cells much upon the same principles as those of the hive bee, the chief difference being that the bee uses for its building materials the wax contained in its own body, whilst the wasp and hornet, which do not feed so largely upon honey wherefrom the wax is secreted, are content to form their nests of particles of wood mashed together, thus making the paper-like substance whereof their nests are composed. The cells of the hornet's nest are larger and fewer than those of the bee. We also find that the different layers or cells are supported with strong columns, which do not exist in the honeycomb. The hornet's nest is attached by a foot-stalk to the object to which it is fixed, and is defended at the base with a kind of fortification wall, containing holes like gates for the exit and entrance of its occupants, each entrance probably having its sentry to prevent the intrusion of enemies.

Before proceeding further with our account of bee architecture, it is needful to observe that the bee's wax is not fit for building materials as it comes from the insect's body. It undergoes another process beyond that of mere secretion. After having exuded from the segments of the bee's abdomen, the insect moistens it with saliva, kneading it and working it to produce the ductility of consistence and opacity necessary for the future structure.

For the mathematical rules observed by the hive bee in its architecture, we refer the entomological student to Lord Brougham's dialogue on instinct, in his interesting work on Natural Theology, which should occupy a part of every naturalist's library. The nest of the Humble Bee (*Bombus terrestris*) differs considerably from that of the hive bee. It consists of a number of horizontal combs, arranged one above the other, connected like the hornet's comb by pillars of wax. The roof of the nest is lined with moss, the fibres whereof, by a most curious and cunning process, performed by division of labour, are felted together into a ceiling calculated to form a perfect protection against cold and damp. The nest, which is 6in. or 8in. in diameter, is reached by a narrow passage only large enough to admit two bees at a time. A comfortable distinct chamber, carpeted with moss, is assigned to the large females, upon whom the propagation of the species depends.

One of the Solitary-Mason Bees (*Anthophora retusa*) builds its nest of coarse sand, lime, or garden mould, in the fissures of brickwork, rocks, and similar convenient places; a circular entrance leads to a single cell, containing one larva, or a young bee, first emerged from this state. Many of the wild bees do not take the trouble of constructing nests, but leave their eggs, cuckoo-like, in nests already formed by other species. Not being concerned for the present with the history of any foreign species of insect, we leave the white ants (*termites*), with their wonderful palaces of the height of 10ft. or 12ft., to those who have had opportunities of observing these strange edifices. Of the hillocks formed by our native species of ants (*Formicidæ*), we have already given a short account in our history of the order HYMENOPTERA. We omitted, however, to mention the fact that the Jet Ant (*Formica fuliginosa*) makes no hillock, preferring to cut out its habitation in old trees, especially the oak and willow, wherein these ants excavate horizontal chambers, which have the appearance of pillar-supported rooms, arranged in stories one above the other. They communicate with each other by galleries, and have a very beautiful architectural effect when seen transversely from without. Among the Lepidoptera some larvæ construct curious coverings for themselves by rolling leaves together, in a manner already described in our account of the larvæ of insects.

INSECTS IN THE WINTER.



TOWARDS the close of autumn there is a general movement in the insect world — thousands of these busy winged beings seeking comfortable quarters wherein to pass the approaching winter. There is a difference in the exact period selected by various species for their winter hybernation, some being able to brave inclemencies of weather better than others do. Well-nigh all kinds, however, hybernate during the hard frosts, and remain either in a complete or partial state of torpor until the spring awakens them into renewed life and activity. Thus the number of insects killed by cold during winter is much smaller than it is generally supposed to be. Nothing is more common than to hear people rejoice in the prospect held out by a severe winter of destruction to insect life. Doubtless great numbers of insects are killed by cold during the winter, but the majority survive it. By the wonderful instinct wherewith they are gifted, insects generally shelter themselves during the winter under non-conducting substances, as a general rule never quitting their retreats until they can do so with perfect security. Like the imprudent swallow of the fable, a few individuals are occasionally tempted forth on bright winter days, and overtaken by frost before they can regain their hybernacula. In these exceptional cases, however, the insects thus exposed do not always suffer from their boldness. Kirby and Spence, from whom we have gathered some interesting facts connected with insect hybernation, inform us that insects may be restored to vitality after having been "frozen into lumps of ice."

The eggs of most insects may be exposed to a temperature of from 20° to 25° below zero without injury.

The Winter Gnats (*Tricocera hiemalis*), which are seen sporting by thousands in the sunbeams on bright winter days, may generally be taken as a sign of continued fine weather, these wise little beings seldom venturing out when there is much probability of a change for the worse ; if, however, a few individuals, bolder than the rest, should be lured forth by temporary sunshine, they speedily retreat again at the earliest indication of a change.

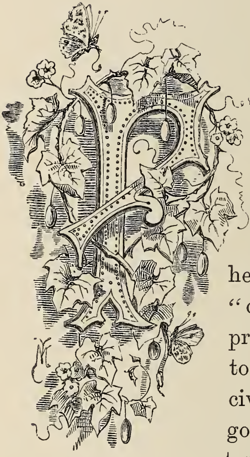
Some insects hybernate under the bark of trees; others, chiefly the beetles, are found buried in the earth to the depth of 2ft. or 3ft. during winter; and we have observed moths and butterflies, especially the Peacock Butterfly (*Vanessa io*), in good condition, hybernating in the perfect state at Christmas under sheds, and in barns and outhouses. Among moths the destructive Gooseberry Moth (*Abraxas grossulariata*) is often found taking shelter beneath broken flower-pots, or any rubbish which may happen to lie about at the season of this insect's hybernation. The majority of insects remain in a state of torpor during whatever state of transition they may have assumed when the cold weather sets in.

When insects hybernate in the larva state, they are, for the most part, supplied with an extra covering of fat, which not only serves, as it were, for a warm external covering, but also supplies a winter store of fuel (charcoal), wherefrom the torpid grub may derive ample warmth during its period of hybernation. A snug position is selected often by Lady-Birds for their hybernacula under the leaves of the *Araucaria*. Many insects are supplied during the winter with an extra covering of hair or down. This, Hüber tells us, is the case with some ants.

Bees, ants, and other insects, whose hybernation is said to be imperfect, have been observed to keep each other warm by herding closely together in great numbers during a fall of temperature.

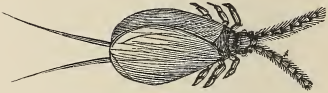
It is commonly supposed that the House Fly (*Musca domestica*) is killed by cold during the winter. It is probable that the fly's departure from among us at the close of autumn is rather owing to the fact of the insect having lived its appointed period than to the fatal effects of cold. This, we think, may be proved by the fact of our frequently finding dead flies on our window panes and furniture in rooms where fires are constantly kept. Another circumstance which seems also to corroborate our opinion that flies are not killed by cold is, that the young flies hatched in great numbers late in the autumn, about September, are the same individuals which crowd our rooms during the summer months. Soon after they assume the perfect state, they probably hide in nooks and crevices in our houses, never venturing out until called forth by summer sunlight to their airy dances in our apartments. The old flies, as we believe to be the case with nearly all insects, die soon after depositing their eggs, so that among our tiresome little enemies we seldom see one whose age exceeds ten months.

OUR INSECT BENEFACTORS.



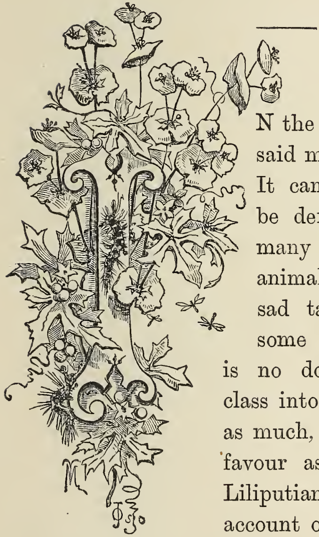
FROM the beginning Man has derived his abundant supplies of food from among the beasts of the field, the birds of the air, and the fishes of the sea, as well as from the "green herbs" of the field; but the "creeping thing," which was also pronounced "very good," seems to have been excluded by all civilised nations from among the good things given for our sustenance. Why do we not eat insects? Are they of more repulsive aspect than the oyster, lobster, or the eel? Truly, he was a brave man who first swallowed an oyster; and it may be, the same amount of courage would be equally rewarded in one who could overcome his horror of a beetle-sauce, or invent a spring soup flavoured with grasshoppers. *Apropos* of grasshoppers, we are informed that their near relation, the Locust, was esteemed a delicacy in Eastern countries. In a learned dissertation on the real nature of the locust named in Holy Scripture as forming part of John the Baptist's meat, Dr. Kitto comes to the conclusion that the prophet's food was actually the insect universally known by the name given to it in the Bible; and the same learned commentator adds his own experience as to the excellence of this insect for food by comparing it to the shrimp, which he says the locust more nearly resembles than anything he had ever tasted. The refined Romans introduced in their banquets a "large fleshy grub" (*Cossus*), probably the larva of the Great Goat Moth (*Cossus ligniperda*); and truly we cannot but marvel at their want of fastidiousness in this instance, as this insect emits while living such a rank and fœtid odour that it is almost impossible to occupy the same room with it—it may, perhaps, have been less offensive when dressed for the table. We can, indeed, better understand how the savages of India and America devour beetle grubs, and that the negroes of Africa and Asia consider the White Ant (*Termite*) as a delicacy.

We know not, indeed, why a clean fleshy grub should be less palatable when well dressed than a cockle or periwinkle. Kirby and Spence suggest that insects might probably be added with advantage to our "miserably meagre list of modern pharmacopœias." We have already had occasion, in describing the different orders of insects, to notice the indirect benefits we derive from these beings, as cleansing the earth of impurities, supplying food to other animals, and a vast number of good services they perform for us (despite their occasional depredations) in the vegetable kingdom. Setting aside the gourmand's *cui bono,* let us take a hasty glance at some of the actual good for which we are indebted to the insect world. Any infant-school student can remind us of our debt of gratitude to the "little busy Bee." What say our ladies for the Silkworm? Imagine the author's state of desolation without his ink, for which he has to thank the minute Gall Fly. How cold our rooms would appear without occasional relief afforded by the bright dye produced by the Cochineal Insect (*Coccus cacti*). We have some useful gums, manna, and the lac of sealing wax produced by the boring operations of various insects upon certain plants. Time, however, would fail us to tell of the legion of these beings which the ancients had the good fortune to discover as useful in their beautiful arts and manufactures. But let us not omit to mention in this list of insect benefactors the Spanish Fly (*Cantharis vesicatoria*), of such inestimable service for medical purposes.



COCHINEAL INSECT
(*Coccus cacti*).

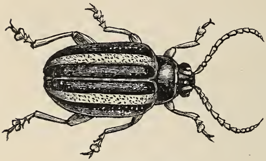
MAN'S INSECT ENEMIES.



In the preceding pages we have said much in praise of insects. It cannot, however, in justice be denied that mankind has many enemies in this class of animals. Notwithstanding the sad tales we have to tell of some of our favourites, there is no doubt, taking the whole class into judgment, we shall find as much, if not more, evidence in favour as there is against this Liliputian world. Having in our account of the different orders of insects unintentionally omitted to name a few mischievous species, we propose here to remedy this deficiency by condemning the culprits which had escaped our notice.

To begin with the Beetles. A pretty common beetle, which does us much mischief, is the Turnip Flea

(*Haltica nemorum*). It is about the size of a flea. The elytra are greenish-black, with a defined yellow band along each wing-case. Its name, which signifies "leaper of the groves," may seem somewhat inconsistent with its habits. This name, however, was given to it before turnips were as plentiful as they now are, when these beetles frequented the grove more than they did the field. The name flea, we believe, is given to them on account of their great powers of leaping, otherwise they bear no resemblance, except in size, to our irritating domestic enemy. The turnip flea attacks the turnip just as its first tender seed leaves appear above ground, these insects assembling by myriads at their destructive banquet, so that the mischief committed by them is as rapid as it is extensive. It is the perfect insect which thus injures us. When telling, in a former chapter, of the magpie or gooseberry moth's larvæ and their destructive work among our gooseberry and currant bushes, we perhaps blamed the caterpillar more than it actually deserves; for a hymenopterous insect, one of the common Saw Flies (*Nematus grossularæ*), strips the leaves from our bushes in greater quantities and with more rapidity than the magpie moth's larva does. The saw fly also attacks the foliage of the apricot.


TURNIP FLEA
(*Haltica nemorum*).

POPULAR ERRORS ABOUT INSECTS.

NO PART of zoological science, perhaps, has suffered more than entomology has done from popular errors, which have not only blinded us to the interesting features of the insect, but led us to neglect and destroy among this class many beings which have been sent among us doubtless for our good. In our ignorance, or want of thought, we condemn as destructive the insects found among our unhealthy vegetation, nor pause to consider whether the little intruders may not have assembled in such places with some better object than that of devouring or otherwise injuring our crops. Thus, the Lady-Bird has often been unjustly blamed by the gardener, whose acute eye failed to notice any diminution in the myriads of plant lice (*aphides*) whereupon the Lady-Birds had been feeding, and proving themselves a better remedy against "*the blight*" than all the smoking and washing which had been previously tried without effect to get rid of it. How irrationally do we wage war against the Wasp, which the experience of the most careful observers tends to prove inoffensive, except when previously irritated? It would not sting us, probably, if we could allow it to pitch on us without any attempt to crush it in its temporary resting-place. It may be, however, we blame it for depredations in the fruit garden without considering how minute the portion it claims of our abundant supplies, or how small the extent of its petty thefts in proportion to the good service it does us in clearing away the decayed animal and vegetable substances, which, but for the help of this insect scavenger, would constantly offend our senses. The disgusting Blow Fly (*Musca vomitoria*) might be banished from the larder by more humane means (such as network, blinds, and wire covers) than the poisoned saucer or less merciful adhesive paper. Let us protect our meat from the Bluebottle, and allow it freely to roam abroad and clear away, through its larvæ (maggots), the dead mouse, bird, mole, &c., which are decaying around us, and doing us much more mischief than was ever committed by our buzzing enemy. Why crush the poor Earwig in our path? It cannot get through the ear into the head, for despite the bitter wax which it will not pass, there is no passage in the ear large enough to admit of the insect's progress to the brain.

We think, indeed, that insects need not be killed by us. Those which are the most destructive (and many, doubtless, are very destructive) are sufficiently kept under by members of their own class, as well as by the wild birds which prey upon them. Leave the wild bird his privilege, and, we believe, little or no murder need be done by us in the insect world. In destroying, however, the insects which are personally injurious to us, we are doubtless justified, for these are often peculiar to human habitations and localities where neither wild bird nor insect enemy can pursue them.

We cannot but condemn the too common practice of destroying any animal merely on account of its unsightly appearance, or some prejudice founded, it may be, upon erroneous notions connected with it—errors, indeed, for the most part, which a little reflection and inquiry would suffice entirely to remove. We think, in short, that man is not justified in heedlessly destroying, for the gratification of a mere feeling of aversion, any being to which God has given life.

Most of the insects provided with a sting will use it as a weapon of defence when irritated or in danger; thus a bee or a wasp will sting when entangled in our hair, or by other means deprived of liberty, its only object being to regain its freedom. We have passed close to swarms of bees, and allowed wasps to hover about us with perfect impunity—at the same time, however, taking care to assure ourselves that the insects had not previously been hunted or irritated.

There are, however, many insects which bite only with the object of feeding upon our blood. This is the case with the gnat, gad-fly, and midge, which do not sting, as commonly supposed—a fact we may easily prove by holding them in a position where, if they could sting, they would certainly do so in order to regain their freedom. We notice this circumstance rather with the object of removing a popular error as to the habits of these insects than in defence of the irritating little beings whose bite, doubtless, is no less annoying and painful to many of us than the wound inflicted by a sting. We are doubtless justified in killing, as mercifully as possible, those animals which attack us simply for the sake of gratifying their appetites at our personal expense.

Let us be careful, then, to avoid over-familiarity with our insect friend before we have made ourselves somewhat acquainted with its character and habits. We were informed, when quite inexperienced in entomology, that the Humble Bee (*Bombus terrestris*) could not sting, and with perfect confidence in our rustic informant, caught in our hands a huge insect of this kind, proving in a moment, to our cost, the fallacy of this very common popular error; for not only did the bee sting, but inflicted a wound well-nigh as severe as that produced either by the hive bee or the wasp. The Ant stings severely when disturbed in its nest, but will otherwise crawl over you in your summer resting-place without giving you any painful warning of its presence. There is no prejudice more common among us than that against the Cockroach (*Blatta orientalis*), erroneously called the Black-beetle of our kitchens. Doubtless this insect is a great nuisance in our larders, but no being can be more harmless as regards any personal offence than is this poor defenceless creature, which can neither bite, sting, or otherwise injure us, its rapidity of pace seeming to be its only means of escape from the many enemies which have declared war against it. Despite much that has been said to the contrary, we are convinced through our own observation, as well as by the assurance of reliable authorities, that this insect has not the power of flight, the wings being quite rudimentary and unprovided with cases, which are always found fully developed in the true flying beetle. It may be that the general observer has confounded the cockroach with the Black-stone Beetle (one of the *Carabidæ*), which bears some superficial resemblance to the former insect. Being, however, a true beetle, this black-stone *Carabus* belongs to a separate order (COLEOPTERA) to that (ORTHOPTERA) wherein the cockroach is placed. It may here be mentioned that a lady of our acquaintance once said she would rather meet a lion than a "black beetle." We could wish for their own sakes that persons thus afflicted could be induced to overcome their *horror*, under our confident assurance of the perfectly inoffensive character of these despised, creeping things. Perhaps, by studying the more interesting habits of unsightly insects, we might be enabled in some measure to overcome our unreasonable prejudices against them.

A ticking sound, commonly known as the *death watch*, is supposed by some persons—free, indeed, from superstition, but unskilled in entomology—to proceed from a spider. In our description of the beetles (COLEOPTERA) we have given a short account of the innocent little beetle (*Anobium striatum*) which produces this sound by its boring operations.

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